



U.S. Department of the Interior
Bureau of Land Management

BLM Wild Horse and Burro Program 2021 Strategic Research Plan



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BLM Wild Horse and Burro Program 2021 Strategic Research Plan

Executive Summary

The Department of the Interior (DOI) is guided by science in natural resource management.¹ The Bureau of Land Management (BLM) must maintain a thriving natural ecological balance on the public lands it stewards, protecting highly valued wild horse and burro (WHB) populations along with other resources, uses, and values on the public lands system. The BLM and US Forest Service (USFS) were selected by the Congress to protect and manage designated WHB herds, under the 1971 Wild Free-Roaming Horses and Burros Act (hereafter, 'WFRHBA'). However, unmanaged herds often grow at rates of ~20% per year, and many WHB herds that are already larger than appropriate management levels (AML) are currently damaging ecologically sensitive habitats in and near herd management areas (HMAs). WHB herd sizes that exceed the BLM's management objectives can degrade landscapes' potential resilience in the face of climatic change.

This strategy identifies the BLM Wild Horse and Burro Program's current WHB research priorities and lays out a plan to advance the Program's management needs through scientific advances. High-quality research can inform management decisions and save taxpayer dollars over time. The intended audience for this strategy includes BLM and DOI personnel including, specifically WHB program staff, potential collaborators from federal, state, and local agencies, tribal governments, university researchers, nongovernmental organizations, and interested members of the public.

The highest priority research topic remains the development of safe, practical, and effective, long-lasting fertility control methods for mares. The sooner discoveries in fertility control research are made, the sooner the benefits of reduced growth rates can accrue. Currently available contraceptive vaccines have limitations that reduce their usefulness. Trials of promising new methods such as long-lasting vaccines, intrauterine devices (IUDs), and humane², minimally-invasive sterilization procedures could be highly informative.

The second-highest research priority is to study questions about WHBs and their environment that inform BLM's management. In an example of how research could

¹ Presidential Order 13990. Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. January 20, 2021.

² "Humane" is defined in 43 CFR 4700.0-5 (e). "Humane treatment means handling compatible with animal husbandry practices accepted in the veterinary community, without causing unnecessary stress or suffering to a wild horse or burro."

inform BLM's adaptation to climate change, predictions of future forage and water availability could inform local-level herd planning. Related research could reveal how variable herd density and resource availability might interact under future climate change. Research addressing WHB and their ecological context could also complement other BLM-supported research related to wildfire, wildlife, biodiversity conservation, restoration, and climate change.

Funding research in the next five years is central to improving BLM management and reducing costs over the long term. Annual support should be devoted to studies of new and improved fertility control methods, adaptive management actions (Williams et al. 2009) that test promising methods in the field, and to studies of WHB interactions with their environment.

This strategy examines how consistent research funding could be used to address primary and secondary priority research topics, through BLM-funded Requests for Proposals (RFPs) and partnerships with universities and other federal, state, tribal, and non-governmental organizations that share a goal of improving WHB management. Annual RFPs would foster transparent competition to provide the highest-quality research. Translating the results of research into applications in the field is a critical aspect of successfully incorporating science into WHB management.

Lower priority research topics could improve WHB management but are not targeted for immediate and regular funding in this plan. It would be important to fund or facilitate research addressing these questions when possible. These topics include studies that would further improve aerial censuses; develop new insights into WHB genetics; improve health, handling, and welfare; identify factors that improve horse and burro adoption rates; and address human dimensions of WHB management.

Appendix A details research *topics, central management issues, overall goals, research objectives, and some specific research directions as examples*. Appendix B summarizes BLM-supported and other research since 2005, focused on fertility control, demography, genetics, ecology, public safety, and aerial survey methods. Appendix C is an overview of noteworthy fertility control methods.



Background

WHB Research and the BLM

The BLM conducts science-based monitoring and analyses, but it is not a research agency. The BLM has supported peer-reviewed WHB-related research since shortly after passage of the WFRHBA.

The US Geological Survey (USGS), US Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS), USDA National Wildlife Research Center (NWRC), National Park Service (NPS), USFS, and research universities have been important partners in formulating and carrying out WHB research. The BLM also collaborates with other agencies and organizations to support studies that address climate adaptation and resilience, wildlife, land use, fire, and ecosystem restoration.

WHB Research Advisory Team Structure

For WHB-related studies involving any level of BLM support or permitting, or which might include or affect living WHB or their tissues, all research proposals and inquiries must be sent to the WHB Program's Research Advisory Team (BLM IM 2005-204; BLM 2015). The team reviews proposals, solicits outside peer reviews as needed, and makes recommendations to the WHB Program Division Chief who then approves or denies these proposals. The team also monitors ongoing studies to track progress toward study objectives, encourage responsible spending, and advise the WHB Program on current research results.

WHB Overpopulation and Its Effects

The most pressing WHB management concern for the BLM is the need to reduce WHB herd sizes in many areas, due to natural resource constraints. This was stated in the BLM's 2020 report to Congress (BLM 2020), and is centrally important to the priorities in this strategic research plan. When WHB herds are too large, relative to available

natural resources, they can cause substantial damage to rangeland forage plants and soils; outcompete native wildlife species for scarce water; spread invasive plant species such as cheatgrass; reduce Sage-grouse populations; limit post-fire ecosystem recovery; and affect authorized grazing (Crist et al. 2019, Coates et al. 2021). To the extent that excessive herds of WHB may consume high volumes of vegetation, cause erosion, foster ecological type conversion to annual grasslands, and hamper rangeland restoration projects, they could contribute to net carbon release to the atmosphere (i.e., Booker et al. 2013). Effects of excessive WHB herds may become more pronounced in areas where climate change will further reduce available water and forage resources and increase the frequency of large-scale prolonged drought or catastrophic wildfire (Beever and Aldridge 2011). Even though burros, and some horses, may dig to water within 2 m of the surface of intermittent streams (Lundgren et al. 2021), that behavior does not alleviate drought, and is not expected to mitigate the expected, widespread effects of climatic change.

Herds in most HMAs are overpopulated relative to AML but can still grow at average rates of approximately 20% per year for horses, and 15% per year for burros. As of March 2021, the BLM estimated that there are slightly more than 86,000 BLM-managed wild horses and burros inside and outside the 177 herd management areas (HMAs). The national total appropriate management level (AML) across all HMAs is a range between 16,320–26,770 animals. Such high WHB populations are already unsustainable for the lands in and near many herd management areas. If herds continue growing, resource degradation is expected to eventually cause massive local die-offs (NAS 2013).

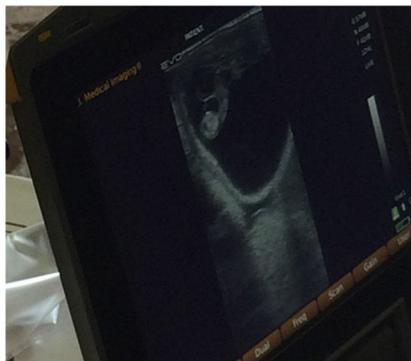
Fertility Control

Decreasing the growth rates of WHB living on the public lands is an essential part of BLM's management strategy (BLM 2020). The BLM is committed to ensuring that all potential population growth suppression methods are humane. New solutions to fertility control could reduce on-range growth rates and annual WHB program costs. Animals removed from the wild add to off-range costs, which are the majority of today's total WHB program costs. Even animals that are successfully adopted within a year of capture entail costs to the BLM. In most cases, using only short-term fertility control vaccines is not expected to significantly reduce the size of on-range populations, because it can take decades of slowing population growth before a reduction in population size is realized. Animals must be treated many times to apply short acting vaccines and this can cause undue, repeated stress to animals, and increases program costs. Longer-lasting fertility control measures could lead to large taxpayer cost savings (Bartholow 2004, 2007, deSeve and Boyles-Griffin 2013), if herd growth rates are substantially reduced.

Animal Care in Research

BLM management activities do not require institutional animal care and use committee (IACUC) oversight, but common sense and the public interest demand safeguards on WHB care in any study. Research institutions such as universities often include IACUC oversight and approval for any animal care and use protocols for research involving vertebrates. When BLM partners with universities on research projects, those institutions may need IACUC approval to participate, even when it is not required of BLM for its own management activities.

Uterine ultrasound, visualizing an IUD in domestic horses



Horses and burros have long lifespans, early ages of first reproduction, and high fertility rates. Any fertility control method will work best when a high fraction of mares is treated. This is easier and less expensive when herd size is relatively low, such as when it is at or near AML (Fonner and Bohara 2017). The most effective way to achieve and maintain herds at AML levels is to annually remove a large number of animals from the range, and to use fertility control methods to slow population growth in herds that are relatively close to AML (BLM 2020).

The BLM currently uses two forms of porcine zona pellucida (PZP) vaccine, and one gonadotropin releasing hormone vaccine (GonaCon). None of these is ideal. PZP ZonaStat-H vaccine has a 90% efficacy rate (i.e., expect a 90% reduction in fertility for treated mares), but requires a booster 4-6 weeks after initial inoculation and, for the first several doses, mares must be treated every year to remain infertile. PZP-22 vaccine pellets have lower efficacy (i.e., 50% or less) from one dose, and marginally better effects for 3 years after PZP vaccine boosters. (Rutberg et al. 2017). GonaCon has an efficacy rate of 30-40% in the first year; however, if a booster is applied by hand after the initial dose, its efficacy rate increases up to ~90% for the next 4-5 years (Baker et al 2018). Although the BLM will continue to use PZP, especially where darting has been successful, the BLM plans to significantly expand the use of GonaCon.

Sterile animals do need not to be recaptured so, where practical, permanent humane sterilization options could be a

fiscally responsible part of local herd management, leading to a large decrease in herd growth rates. At the same time, the BLM recognizes the if sterilization is used in management, it will be important to ensure that overall populations are self-sustaining, including with adequate genetic diversity at the herd and metapopulation levels.

Previous Directions for WHB Research

The research priorities in this document were influenced by the 2005 Strategic Research Plan, Wild Horse and Burro Management (BLM 2005), and by a BLM-commissioned, 2013 National Academies of Sciences report (NAS 2013).

Appendix B summarizes known WHB research projects in the US since 2005. BLM research support in FY 2015, for projects related to fertility control, aerial surveys, ecology, demography, and genetics, represents the majority of BLM-funded WHB research in the last 10 years.

In certain circumstances, the BLM can take management actions (such as applying a fertility control treatment), closely monitor and assessing the effects of those actions (i.e., in terms of foaling rates), and potentially change future management actions in light of the outcomes. This framework is known as 'adaptive management' (see inset; Williams et al. 2009). Adaptive management should not be confused with 'adaptation' with respect to climate change. 'Climate adaptation' means adjusting natural or human systems in anticipation of, or response to, a changing environment in a way that effectively uses beneficial opportunities or reduces negative effects (Lempert et al. 2018).

Adaptive Management

Adaptive management can be a structured approach to decision-making that addresses open questions about how a system works (Williams et al. 2009). Generally, the agency sets a management goal (e.g., having a herd grow at a specific, low rate), takes a management action (e.g., treating a known fraction of animals with a fertility control method), monitors the outcome (e.g., determining whether there is a change in growth rate), and changes management actions as needed, based on the results. In contrast, experimental research projects are not usually linked to specific management decisions. As is true for other management actions, NEPA analysis in adaptive management addresses potential impacts of different alternatives.

Vegetation measurement cage





Current Research Priorities

Because of the ecological effects of large and expanding WHB herd sizes, the highest priority *research topic* remains long-lasting fertility control methods, and the second highest priority is understanding more about relationships between WHB and the environments upon which they depend.

Highest Priority: Long-lasting Mare Fertility Control

The research topic of highest priority at this time is the development, testing, and application of safe and humane mare fertility control methods that last three to five years – or are permanent – from one treatment. The central management issue motivating the BLM to name this as the highest priority for research is the large and increasing number of excess WHB living on the range, relative to available resources.

Mares (female horses) are the focus of this research priority. Long-lasting female fertility control could reduce herd growth rates over time, the need for removals, and long-term holding costs (NRC 2013, BLM 2020). There is a direct, causal link between the number of fertile females in a herd and the herd's growth rate (Collins and Kasbohm 2016). Removals immediately reduce population size, but demographic models point to mare sterilization, or long-lasting mare fertility control, as the most effective way to reduce annual herd growth rates. Long-term fertility control methods that require minimal handling can be seen as a minimum level of management necessary³ to meet land use objectives and ensure WHB health and welfare.

³ 43 CFR 4710.4 Constraints on management. Management of wild horses and burros shall be undertaken with the objective of limiting the animals' distribution to herd areas. Management shall be at the minimum level necessary to attain the objectives identified in approved land use plans and herd management area plans.

So long as welfare, health, and free-roaming behaviors are not adversely affected by a given humane fertility control method, more specific behavioral effects of fertility control methods – such as changes in group size, band structure, and habitat use – are no longer considered centrally important research topics at this time. Impacts on animal health and welfare caused by overpopulation are further causes for concern that motivate the primacy of research into long-lasting, effective fertility control.

In the recent history of BLM-funded WHB research, one pattern of fertility control method validation has been to: (1) use initial studies to test safety, prove a mechanism of action, and make preliminary estimates of efficacy rates; (2) use pen trials with a larger sample size to quantify efficacy in captive animals; and (3) use field trials to test whether practical management applications using the method measurably reduce population growth rates. However, given the urgent need to reduce on-range growth rates, methods that have already been shown to be safe, humane, and effective might be more quickly considered for field trials, without pen trials. For field trials to be informative, researchers or managers must be able to determine the effectiveness of the method tested, based on observations and monitoring in the wild (e.g., though accurate documentation of fertility rates for treated mares).

NEPA and Research

The National Environmental Policy Act (NEPA) requires the potential impacts of some federal actions to be analyzed, with opportunities for public review. Such actions have included whether to gather and remove animals from the range, use fertility control, or house excess animals in off-range pastures. Categorical Exclusions (CX) are appropriate for certain federal actions that do not have a significant effect on the human environment and for which neither an Environmental Assessments nor an Environmental Impact Statement is required; this may include some WHB research activities. There is a DOI CX for “Nondestructive data collection, inventory ... study, research, and monitoring activities.”

Wild horse aerial survey



Any proposed research projects with BLM-administered wild horses or burros require conformance with the National Environmental Policy Act (NEPA; see inset), and may be subject to administrative appeals and litigation. Wherever possible, research involving WHBs will take advantage of previously planned management activities.

Field trials could be used to validate predictions from population projection models. For studies requiring detailed observations, the BLM may need to partner with research universities, USGS, USDA, or other institutions. For projects where less-intensive periodic monitoring is adequate (such as via aerial survey), the BLM may be able to quantify the outcomes of fertility control treatments using BLM expertise.

Long-term fertility control could use physical, pharmacological, or immunological methods. Some methods are noted in **Appendix C**, but the BLM could also consider other humane methods, including, surgical and non-surgical mare sterilization methods. Some of the methods below were discussed in the NAS report (2013).

Research into Burro or Stallion Fertility Control is not a Priority

Compared to fertility control for mares, research into burro fertility control, or stallion (male horse) fertility control is not a priority. While wild burro herds are at levels well above AML, it is the BLM's recent experience that almost all wild burros can be removed from the wild and placed into private care at costs that are comparable to the cost of treating and releasing them.

The BLM typically uses the word 'neutering' to refer to the sterilization of a stallion (male horse) or jack (male burro), either by castration (also known as gelding) or by vasectomy. Neutering stallions is not expected to reduce herd growth rates in the long term unless approximately 80% or more are treated (Garrott and Siniff 1992).

Maintaining this level of treated stallions would require relatively frequent gathers. Some neutered males may retain harems for some time (USGS, unpublished data), but growth rates are largely determined by the fraction of fertile females (NAS 2013).

Second Highest Priority: WHB and the Environment

The *central management issues* for this research priority are that self-sustaining WHB herds rely on natural resources in their environments, and that WHB herds above AML can prevent the BLM from fulfilling its mission to sustain the health, biodiversity, and productivity of public lands. Research projects would address ecological relationships between WHB and their environments. Studies may also address the effects of climate change on WHB populations. To protect the quality of resources and values on the lands it manages, the BLM must ensure that ecosystems on the public lands system meet rangeland health standards (BLM 2001), including where WHB roam. In doing so, the BLM provides adequate resources and thriving natural rangelands where WHB live, so that widespread populations of these treasured animals exist into the future.

The BLM needs to improve its understandings of the current and expected future state of natural resources in the lands where WHB live, and of the effects of WHB on rangeland ecosystem conservation and restoration. The BLM must have accurate scientific projections of future conditions, to plan climate adaptation actions that will ensure that WHB herds will continue to be self-sustaining and that the rangelands they depend on will be in a thriving natural condition. The BLM could benefit from localized climate change predictions, when evaluating AMLs, using available or new forecasts about future water and forage availability.

So long as herd sizes are far above AML, ecological damage may result (e.g., Crist et al. 2019). WHB herds that are much larger than established AML values likely reduce landscape resilience to the effects of climate change. Studies of some specific interactions between WHB and the environment may be needed to inform the BLM's efforts to conserve biodiversity and increase landscape resilience to climate change. For example, a recent model indicates that wild horse herd sizes above AML contribute to Greater sage-grouse population declines (Coates et al. 2021). It could be valuable to know whether rangelands where wild horse herds are at AML serve as valuable habitat for other sagebrush obligate species, or to know how to minimize adverse impacts of WHB on sensitive desert species, such as desert tortoises (e.g., Berry et al. 2020).

Finally, it is possible that the capacity of western rangelands to offset greenhouse gas emissions may be marginally affected by WHB density. Net carbon sequestration in most arid rangelands is controlled largely by abiotic factors such as available moisture (Booker et al. 2013), but it may be useful to understand how overpopulated WHB herds interact with stored soil carbon (e.g., He et al. 2011, Svejcar et al. 2014).

Lower Priority Research Topics

All of the following topics are of a relatively lower priority. The order of the topics below is not an indication of their relative importance.

Herd Size Estimates and Demographic Modeling

The central management issue this *research topic* addresses is the ongoing need for accurate, precise, safe, and cost-effective methods to estimate the number of WHB on the range, and the need to predict the demographic effects of different management scenarios on managed WHB herd sizes. Accurate and repeatable population surveys are vital to inform the BLM of current herd sizes and to evaluate the outcomes of management actions. Accurate herd growth rates and foal to adult ratios can be important measures in adaptive monitoring field trials that assess the effectiveness of fertility control methods.

From Research to Monitoring

Scientists have developed methods that can improve wild horse and burro ecological monitoring on the range. For example, lightweight GPS tags braided into horse tails can send near real-time information about animal locations, and satellite imagery can map out seasonal and annual changes in rangeland vegetation productivity.

Drawing on these advances, the BLM could add new data collection and analytical methods to improve monitoring after management actions. The BLM could also use tailored assessment inventory, and monitoring (AIM) data collection methods to foster west-wide monitoring of WHB herds and habitats. Record-keeping could use a standardized set of methods and objective measures that matter to land managers and interested parts of the American public, such as forage use, resource conditions, watering frequency, location, seasonal migrations, and group membership. The BLM could partner with other agencies and groups to develop and conduct this monitoring.

BLM interns monitor a riparian area



For more than 15 years, the BLM has worked with the U.S. Geological Survey to improve the science-based survey methods. Further improvements in the BLM's methods for accurate inventory are always possible. BLM staff safety remains a concern, as low-level, manned flights pose known risks.

Burro Surveys

Burros are notoriously difficult to see from the air. Aerial surveys may substantially underestimate burro population sizes. USGS has been developing and testing a new method for burro survey analysis that draws on standard operating procedures for WHB surveys (Griffin et al. 2020) and data from radio collared animals (see Appendix B). Depending on results from that study, further methods may be needed.

Uses and Limits Infrared Surveys

Infrared surveys may entail relatively lower risk than visual flights, because infrared surveys can occur at higher elevations above the ground, and BLM personnel are not needed in the aircraft. However, the accuracy of infrared flights for WHB is not well quantified. Environmental factors such as ground temperature, tree cover, and snow cover may influence the results. In some wild horse herds, infrared-based survey estimates were comparable to known herd size (Schoenecker et al. 2018) or to double-observer based estimates (BLM unpublished data), but infrared surveys can lead to severe undercounts including in burros or bison (BLM and USGS, unpublished data; Hennig et al.

2021) and forested areas (USFS, unpublished data). Before this method is used widely, the BLM needs to understand the conditions under which infrared surveys are reliable.

Population Genetics

The *central management issue* for this research priority is the BLM's interest in using the best available science and technology to ensure that the genetic diversity in free-roaming WHB is adequate for self-sustaining populations. Genetic diversity monitoring using microsatellite DNA markers from hair follicles (NAS 2013) or feces (King et al. 2018) is now somewhat routine. The BLM uses results of that monitoring, for example in deciding whether to increase local genetic diversity by introducing animals from another HMA. However, some genetic analyses are at the intersection of research and monitoring. The NAS report (2013) advised that the BLM should recognize genetic connections between HMAs, and manage WHB as metapopulations. WHB management could be improved by research that uses genetic samples to identify metapopulation structure at several spatial scales, or which quantifies genetic connectivity between HMAs. The BLM may also benefit from applications of other genetic marker systems, such as are used in single nucleotide polymorphism (SNP) chips for equids. Research may be needed to define best practices for new methods.

WHB Health, Handling and Welfare

The *central management issue* for this area of research is the BLM's need provide the best and most humane care and handling for healthy WHB. The majority of the specific research directions listed for this topic (Appendix A) are related to care in a corral or pasture setting, but the BLM also faces these challenges on-the-range and during gathers. BLM managers should rely on the best, most current information to maintain WHB health and welfare. The BLM's capture methods lead to good animal welfare outcomes (Scasta 2020), but the agency always aims to improve. Advances in domestic horse and burro health, handling, and welfare may be applicable to WHB. In some cases, though, health, handling and welfare issues arise that are specific to WHB, and which may require dedicated research efforts.

Private Care Placement

The *central management issue* for this research priority is that the BLM is motivated to place WHB with private citizens and organizations that will responsibly care for their welfare. Lifetime long-term holding costs for wild horses removed from the range can be in the tens of thousands of dollars per animal. Research that helps the BLM identify new and innovative ways to place off-range animals into private care can help connect animals with responsible owners, and can potentially lead to long-term cost savings. A retrospective analysis of animals placed by the BLM identified that size and color are attributes that make BLM wild horses more or less likely to be placed into private care (Bender and Stowe 2020). Future studies might address what other physical or behavioral attributes make animals more or less trainable and adoptable.

Human Dimensions of WHB Management

The *central management issue* for this research priority is that all decisions related to public lands management are influenced by human understandings about the environment, and take place in a societal context. The BLM's actions can be informed by, and can influence, public perceptions. Sociological and anthropological research into human attitudes and behaviors regarding WHB could help to inform the BLM about public preferences regarding WHB management options. The landscapes where WHB live are heavily influenced by human decisions at local, regional, and national scales. Conversely, WHB herds can influence the human environment in many ways. Ecosystems – and WHB herds – cross administrative boundaries, so the BLM's management often must include consultation with sovereign tribes, or other federal, state, and local agencies. Those entities, along with non-governmental organizations and private citizens, have viewpoints on WHB management, and can contribute to new paths for WHB management.



Strategies to Support New Research and Adaptive Management

This strategic research plan calls for annual funding in each of the next five years, to allow the BLM to field test promising fertility control methods, and foster development of new long-lasting fertility control methods, and to allow BLM to fund studies that address the relationships between wild horses and burros and their environment, including projections of the effects of climate change. Whenever possible, Requests for Proposals (RFPs) will be the preferred funding approach because RFPs foster the greatest level of competition and public transparency. Some designated research funding could cover research-related BLM operational costs, such as for fertility control treatments, and monitoring.

Research and adaptive management projects should focus on developing techniques and insights, bringing promising methods to the field, and determining whether their use is effective. Horses breed once a year and have long gestation periods, which

means that fertility control trials can require many years to complete. The BLM's 2020 report to Congress suggested that research needs may cost up to \$20 million over a 15- to 18-year period, but could lead to breakthroughs in longer-lasting fertility control and humane mare sterilization methods, which could significantly reduce herd growth rates and future program costs.

A consistent and organized source of funding over time could keep the research community engaged, and lead to the development and testing of many more potential methods. The BLM will conduct extensive outreach to inform the research community about RFP opportunities, and will include prominent notifications about RFPs and the research proposal review process on its WHB web site.

Applying innovative management actions and then closely monitoring their effects can help achieve local management objectives and also inform the larger WHB program. To be successful, adaptive management projects need support from BLM leadership, dedicated staff time and field resources, and environmental conditions where population monitoring is relatively accurate and precise.

Agreements will likely continue to be the most commonly used instruments for the BLM to fund WHB research. Contracting could be appropriate in cases where discrete tasks can be identified in advance. Memoranda of understanding could promote parallel actions taken by multiple entities. The BLM seeks other partners for these efforts. In the past, NPS, US Fish and Wildlife Service, USDA NWRC, USFS, Department of Defense, Arizona Game and Fish Department, Arizona Department of Transportation, Wyoming Department of Transportation, and Humane Society of the United States have also supported WHB research (e.g., Kirkpatrick 1995, Baker et al. 2013, Collins and Kasbohm 2016, Rutberg et al. 2017, Gedir et al. 2021). Even where the BLM cannot directly fund research costs, it may be able to provide in-kind support, such as through WHB captures or removals and the conduct of basic monitoring.

Conclusion

Wild horses and burros contribute unique value to public lands of the American West. The BLM's challenges and opportunities in WHB management could be informed and improved through new research studies and well monitored adaptive management projects. The BLM is eager to work with partners that share an interest in improving WHB management through scientific investigation, and then applying the results of research. It is hoped that discussions around research priorities in this document, and the path for continued WHB research funding, may lead to collaboration between BLM, academic researchers, other agencies, sovereign tribes, non-governmental groups, and interested members of the public. The BLM looks forward to sharing the results of projects that it supports, and seeks to learn from other work that addresses the priorities identified here.

Appendix A. Specific Priority Research Topics and Goals
Appendix B. Overview of WHB Research and Related Projects
Since 2005
Appendix C. Fertility Control Methods



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