BLM Wild Horse and Burro Research Highlights

The BLM Wild Horse and Burro Program 2021 Strategic Research Plan, released in October 2021, identified the BLM's two highest priorities for agency-funded WHB research. The BLM then solicited research proposals to address these topics. Proposals could be funded if they were responsive to either of the following:

- *Development and/ or testing of new or improved long-lasting fertility control methods for mares*, and/ or testing the application of existing methods in a way that provides essential information for successful application of long-lasting fertility control methods for mares, and/ or testing and documentation of the effects of new or existing long-lasting fertility control methods for mares.
- *Examination of the relationships between wild horses or wild burros and their environment*, with potential special attention paid to effects of climate change, or effects of wild horses or burros on ecosystem resilience to climate change.

Eligible proposals from academia, government research agencies, and nonprofits were reviewed by external panels of subject matter experts and by an interagency internal panel.

In July 2022, the BLM shared its preliminary analyses of three research projects into potentially long-lasting fertility control methods that would include federally-protected wild horses, in preliminary Environmental Assessment DOI-BLM-HQ-2600-0001-EA. The BLM is still considering public comments and has not yet issued a final EA or decision record for the studies in that proposed action.

- Study A ("**Identification of a single-dose, long-lasting adjuvant for Oocyte Growth Factor vaccine**") would include an initial 8-month test of four oocyte growth factor (OGF) vaccine formulations, used to identify the two formulations that lead to the greatest immune response in mares. The contraceptive effects of those two OGF vaccine formulations would then be tested during a 3-year pen trial.
- Study B ("**Improvements to SpayVac Vaccine Efficacy and Duration**") would test the contraceptive effects of the SpayVac formulation of PZP vaccine for up to 5 years. Both studies A and B would use captive mares and stallions that were previously gathered and removed from the range under 16 U.S.C. 1333(b)
- Study C ("**Performance of the iUPOD intrauterine device in free-roaming mares**") would treat non-pregnant wild mares with a flexible IUD design, known as iUPOD, radio-collared, and then returned them the range. The free-roaming mares would be observed to document contraceptive and behavioral effects of the IUD treatment over 4 years. Outcomes would be compared against GonaCon-Equine fertility control vaccine-treated mares.

The BLM will fund a proposal for a preliminary study into the use of a viral vaccine that would work by targeting the "Juno" molecule receptor. The project title is "**Long-term contraception through inhibition of Juno, an egg receptor required for fertilization**." This three-year project at the California Institute of Technology does not involve any horses as research subjects. Any testing with wild horses would be years in the future, and would require separate analysis and consideration. The study is a proof-of-concept that will include studies of protein biochemistry, in vitro assays, and, if those are successful, in vivo testing in mice. This would be a form of gene therapy that does not affect reproductive cells. The approach is similar in some ways to injectable methods that are being tested to reduce dog and cat fertility. As with the J&J Janssen COVID-19 vaccine, the virus would cause muscle cells to make a protein. In this case, the protein expressed would be designed to prevent sperm from fertilizing eggs, because it would bind to 'Juno' proteins on the surface of unfertilized eggs.

The BLM will also support two projects received in response to the 2021 proposal solicitation, addressing WHB and their environments including potential effects of climate change:

- "**A protocol for predicting habitat resilience to climate change on WHB habitats**" (Utah State University) This 3-year study would: 1. Develop a WHB habitat index by identifying and mapping 'usable space' in HMAs; 2. Use remotely-sensed measures to evaluate relationships between habitat conditions and herd size through time; and 3. Produce a 'resilience index' for each HMA based on local climate projections
- "**Livestock and wild horse influences on vegetation and wildlife in sagebrush ecosystems**" (USGS) This 3-year study would use a west-wide database to analyze effects of livestock, and wild horses, on ecosystem health indicators: vegetation cover, biomass productivity, sage grouse and sagebrush obligate bird population dynamics.

Since April 2021, the agency approved three other WHB research project proposals that do not require agency funding.

- **"Using social science to inform the BLM's Wild Horse and Burro Program's organizational capacity and s**cientific decision making to improve transparency and public relations" (University of Oregon) This study is structured to document the sociological connections and employees' professional roles in WHB decisions
- "**Effects of wild horses and burros on wetland ecosystems**" (Aarhus University, Sweden) This study will address interactions between WHB, wetlands, vegetation, and predators. In locally-supportive BLM jurisdictions, Aarhus University is permitted to place remote cameras, conduct non-invasive plant sampling, use small drones to record vegetative conditions, and apply scents in an experimental framework.
- "**Diet-microbiome interactions across ecologically diverse horse and burro populations**" (University of California, San Diego) This study will assess microbial communities in gut flora across a range of environmental conditions. UCSD will collect fecal samples and get advice from supportive local BLM offices on where to collect.

In **May 2022**, BLM WHB program leadership, management and staff attended the 9th International Conference on Wildlife Fertility Control. Dr. Jenkins gave a plenary talk. Results from a number of BLM-funded projects were presented as oral presentations or posters.

Ongoing Monitoring, using Research-Validated Methods

Since 2014, the BLM supported research that validated the safety of GPS radio collars, and braid-in GPS tail tags. With help from the USGS, the BLM is now using those techniques in some of its monitoring activities at a handful of HMAs. Providing feed and care to wild horses in a temporary holding facility for 30 days between primer vaccine dose and booster vaccine has been a common and accepted practice for application of the PZP vaccine ZonaStat-H. This method has also been used in wild burros, in the pilot project at Black Mountain HMA, Arizona, with the Humane Society of the United States. Preliminary results from monitoring of GonaCon-Equine treated mares indicate that a 2-dose regime of by-hand injections, with the booster given approximately 30 days after the primer dose, can lead to higher GonaCon-Equine efficacy in the first year after immunization than was reported for animals that only received one dose of GonaCon-Equine vaccine (i.e., Figure 1 of Baker et al. 2018).

The National Academies of Sciences (2013) encouraged the BLM to manage most wild horse and burro herds as elements of metapopulations that are connected by historical connections and genetic interchange on the time scale of horse generations. The BLM continues to monitor genetic diversity, through analysis of hair follicle samples collected at WHB gathers. Those results, along with compilations of previous results such as in the 2013 National Academies of Sciences report, are informative in NEPA analyses and ongoing monitoring. The USGS has analyzed fecal DNA samples for genetic diversity monitoring in the Pryor Mountain HMA; those results are included in current BLM NEPA analyses there.

Results from Previous BLM-funded WHB Research Projects

As detailed in Appendix B of the BLM WHB 2021 Strategic Research Plan, the BLM has funded a large number of research projects in the last decade, especially as a result of funding that started in fiscal year 2015. For most of the projects that started around 2015, data collection was completed in the last few years. Many of the resulting peer-reviewed journal articles have been published, and there are more papers from those BLM-funded studies forthcoming. A list of recent papers follows.

Recent publications from WHB research (Western USA-centric)

Blue font indicates BLM-funded or BLM-supported work. Some non-BLM-supported publications are also listed here because they may relate closely to BLM's WHB management.

Andreasen, A.M., K.M. Stewert, W.S. Longland, and J.P. Beckmann. 2021. Prey specialization by cougars on feral horses in a desert environment. Journal of Wildlife Management: 85:1104-1120.

Bleich, V.C., J.S. Sedinger, C.M. Aiello, C. Gallinger, D.A. Jessup, and E.M. Rominger. 2021. RE: Ecological "benefits" of feral equids command disclosure of environmental impacts. Science eLetters. 19 July 2021. https://science.sciencemag.org/content/372/6541/491/tab-e-letters

Burdick, J., S. Swason, S. Tsocanos, and S. McCue. 2021. Lentic meadows and riparian functions impaired after horse and cattle grazing. Journal of Wildlife Management: DOI: 10.1002/jwmg.22088

Coates, P.S., O'Neil, S.T., Muñoz, D.A., Dwight, I.A., and Tull, J.C. 2021. Sage-grouse population dynamics are adversely impacted by overabundant free-roaming horses. The Journal of Wildlife Management 85:1132-1149.

Esmaeili, S., B.R. Jesmer, S.E. Albeke, et al. 2021. Body size and digestive system shape resource selection by ungulates: A cross-taxa test of the forage maturation hypothesis. Ecology Letters 24:2178-2191.

Folt, B., L. S. Ekernas, and K. A. Schoenecker. in press. Multi-objective modeling as a decision-support tool for feral horse management. Human-Wildlife Interactions 16:in press.

Gedir, J. V, J. W. Cain, B. C. Lubow, T. Karish, D. K. Delaney, and G. W. Roemer. 2021. Estimating abundance and simulating fertility control in a feral burro population. Journal of Wildlife Management 85:1187–1199.

Grams, K., A. Rutberg, and J.W. Turner. 2022. Reduction in growth rates of wild horse populations treated with the controlled-release immunocontraceptive PZP-22 in the western United States. Wildlife Research doi:10.1071/WR21101

Grant, L., R. Sharp, P. Griffin, J. Weikel, and L. Pielstick. High pregnancy rates in two-year old wild horses. Northwestern Naturalist 102:252-253.

Hennig. J.D., J.L. Beck, C.J. Duchardt, and J.D.Scasta. 2021. Variation in sage-grouse habitat quality metrics across a gradient of feral horse use. Journal of Arid Environments 192:104550.

Hennig, J.D., J.L. Beck, C.J. Gray, and J.D. Scasta. 2021. Temporal overlap among feral horses, cattle, and native ungulates at water sources. Journal of Wildlife Management 85:1084–1090.

Hennig, J.D., K.A. Schoenecker, J.W. Cain, G.W. Roemer, and J.L. Laake. 2022. Accounting for residual heterogeneity in double-observer sightability models to decrease bias in feral burro abundance estimates. Journal of Wildlife Management 2022;e22239.

Holyoak, G. R., C. C. Lyman, S. Wang, S. S. Germaine, C. O. Anderson, J. M. Baldrighi, N. Vemula, G. B. Rezabek, and A. J. Kane. 2021. Efficacy of a Y-design silastic elastomer intrauterine device as a horse contraceptive. Journal of Wildlife Management 85:1169–1174.

Kahler, G.V., and S.L. Boyles-Griffin. 2022. Field approaches to wild burro (*Equus asinus*) identification and remote-delivery of ZonaStat-H in an American western landscape. 9th International Conference on Wildlife Fertility Control, Colorado Springs, Colorado. https://wildlifefertilitycontrol.org/wp-content/uploads/2022/05/ICWFC-2022-Program-Book.pdf

King, S.R.B., K.A. Schoenecker, J.A. Fike, and S.J. Oyler-McCance. 2021. Feral horse space use and genetic characteristics from fecal DNA. Journal of Wildlife Management 85:1074–1083.

King, S.R.B., K.A. Schoenecker, and M.J. Cole. 2022. Effect of adult male sterilization on the behavior and social associations of a feral polygynous ungulate: the horse. Applied Animal Behaviour Science 249: 105598.

King, S.R.B., and K.A. Schoenecker. 2022. Application of tail transmitters for tracking feral horses as an alternative to radio collars. Wildlife Society Bulletin 22:e1338. DOI: 10.1002/wsb.1338

Lundgren, E.J., D. Ramp, J.C. Stromberg, J. Wu, N.C. Nieto, M. Sluk, K.T. Moeller, and A.D. Wallach. 2021. Equids engineer desert water availability. Science 372:491-495.

Lundgren, E.J., D. Ramp, O.S. Middleton, E.I. Wooster, E. Kusch, M. Balisi, W.J. Ripple, C.D. Hasselerharm, J.N. Sanchez, M. Mills, and A.D. Wallach, A.D. 2022. A novel trophic cascade between cougars and feral donkeys shapes desert wetlands. Journal of Animal Ecology DOI: 10.1111/1365-2656.13766.

Lyman, C.C., J.M. Baldrighi, C.O. Anderson, S.S. Germaine, A.J. Kane and G. R. Holyoak. 2021. Modification of O-ring intrauterine devices (IUDs) in mares: contraception without estrus suppression. Animal Reproduction Science doi:https://doi.org/10.1016/j.anireprosci.2021.106864

Rubin, E.S., D. Conrad, A.S. Jones, and J.J. Hervert 2021. Feral equids' varied effects on ecosystems. Science 373:973.

Schoenecker, K. A., S. R. B. King, L. S. Ekernas, and S. J. Oyler-McCance. 2021. Using fecal DNA and closed-capture models to estimate feral horse population size. Journal of Wildlife Management 85:1150–1161.

Schoenecker, K.A., S. Esmaeili, and S.R.B. King. 2022. Seasonal resource selection and movement ecology of free-ranging horses in the western USA. Journal of Wildlife Management (in press).

White, H., and C.J. Stowe. 2021. Estimating the capacity of horse owners to absorb the surplus of wild horses. Journal of Equine Veterinary Science 100: 103597 https://doi.org/10.1016/j.jevs.2021.103597

***Of note**: In fall 2021, a special issue of the Journal of Wildlife Management (JWM) addressed WHB management and biology. The contents of the JWM special issue included:*

Boyce, P. N., and P. D. McLoughlin. 2021. Ecological interactions involving feral horses and predators: review with implications for biodiversity conservation. Journal of Wildlife Management 85:1091–1103.

Andreasen et al. (2021; cited above)

Burdick et al. (2021; cited above)

Clancy, C. L., L. M. Kubasiewicz, Z. Raw, and F. Cooke. 2021. Science and knowledge of free-roaming donkeys — a critical review. Journal of Wildlife Management 85:1200–1213.

Coates et al. (2021, cited above)

Gedir et al. (2021; cited above)

Henning et al. (2021; cited above)

Hinchcliffe, D. L., J. M. D. Lea, R. Palme, and S. Shultz. 2021. Fecal glucocorticoid metabolites as biomarkers in equids: assay choice matters. Journal of Wildlife Management 85:1175–1186.

Holyoak et al. (2021; cited above)

Schoenecker et al. (2021; cited above)

Schoenecker, K.A., S.R.B. King, and T.A. Messmer. 2021. The wildlife profession's duty in achieving science-based sustainable management of free-roaming equids. Journal of Wildlife Management 85:1057–1061.

Scorolli, A. L. 2021. Feral horse population model and body condition: useful management tools in Tornquist Park, Argentina? Journal of Wildlife Management 85:1162–1168.

Stoner, D. C., M. T. Anderson, C. A. Schroeder, C. A. Bleke, and E. T. Thacker. 2021. Distribution of competition potential between native ungulates and free-roaming equids on western rangelands. Journal of Wildlife Management 85:1062–1073.

***Also of note**: In 2022, a special issue of the journal called "Human-Wildlife Interactions" will address WHB management and biology. A table of contents is not yet available.*