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

WHB Program Research Update

Advisory Board September 2022

Outline (Advisory Board can change this)

2021 WHB Strategic Research Plan

Why prioritize long-lasting mare fertility control?

GonaCon-Equine; research & monitoring

New and Proposed Projects

2021 Request for Proposals

Fertility Control Research

WHB and their Environment / Climate / Resilience

Permitted, non-BLM-funded projects

Black Mountain HMA PZP burro darting project

Presented with Humane Society of the US

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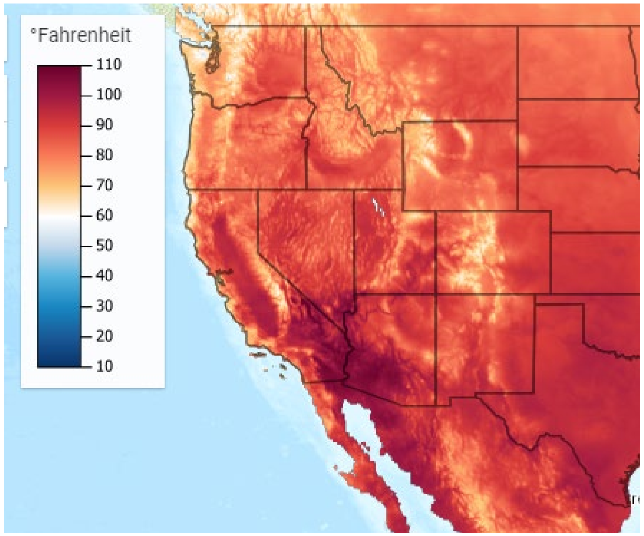
Future Climate (Examples)

Avg. Summer Daily Max Temp

Historical 1961-1990

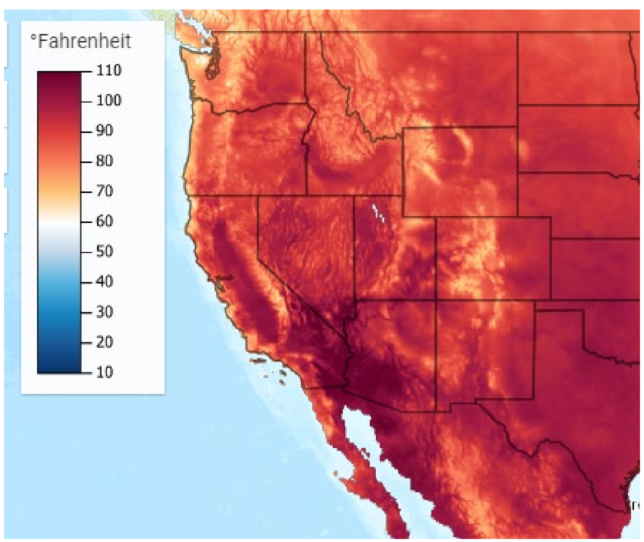


The future is increasingly hotter.

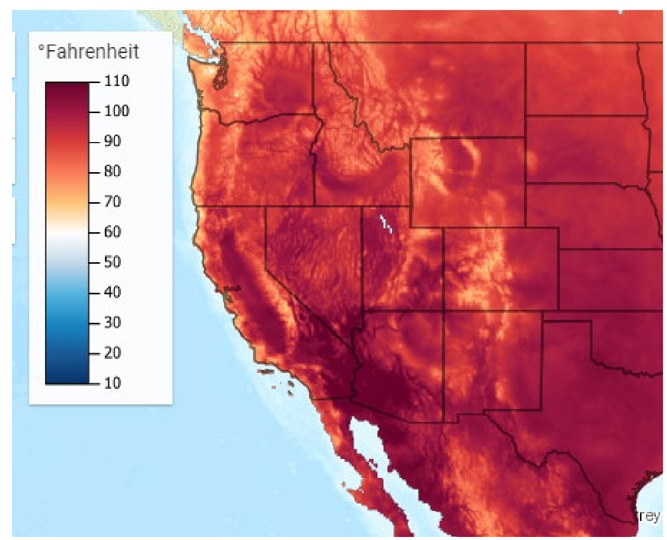
Precipitation will change regionally in both season and amount, and be more variable.

BLM needs to plan for this change, protect WHB and their habitats

2040s



2060s



https://crt-climate-explorer.nemac.org/climate_maps

WHB 2021 Strategic Research Plan

Highest Priority: Development of safe, practical, and effective, long-lasting fertility control methods for mares

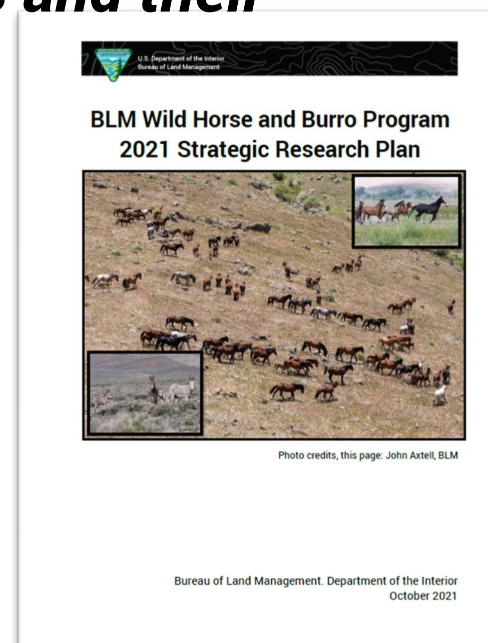
- Identify and explore new, safe, long-lasting or permanent contraceptive treatments… These could be injectable, non-surgical or surgical treatments or procedures
- Identify improvements to existing contraceptive or sterilization treatments or procedures that could increase their practicality, efficacy or duration

2nd Highest Priority: Study questions about WHBs and their environment that inform BLM's management

- Quantify how WHB population densities affect the environment
- Quantify how environmental conditions affect WHB populations

Lower Funding Priorities

- Herd Size Estimates and Demographic Modeling
- Population Genetics
- WHB Health, Handling and Welfare
- Private Care Placement
- Human Dimensions of WHB Management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BLM Wild Horse and Burro Program
2021 Strategic Research Plan

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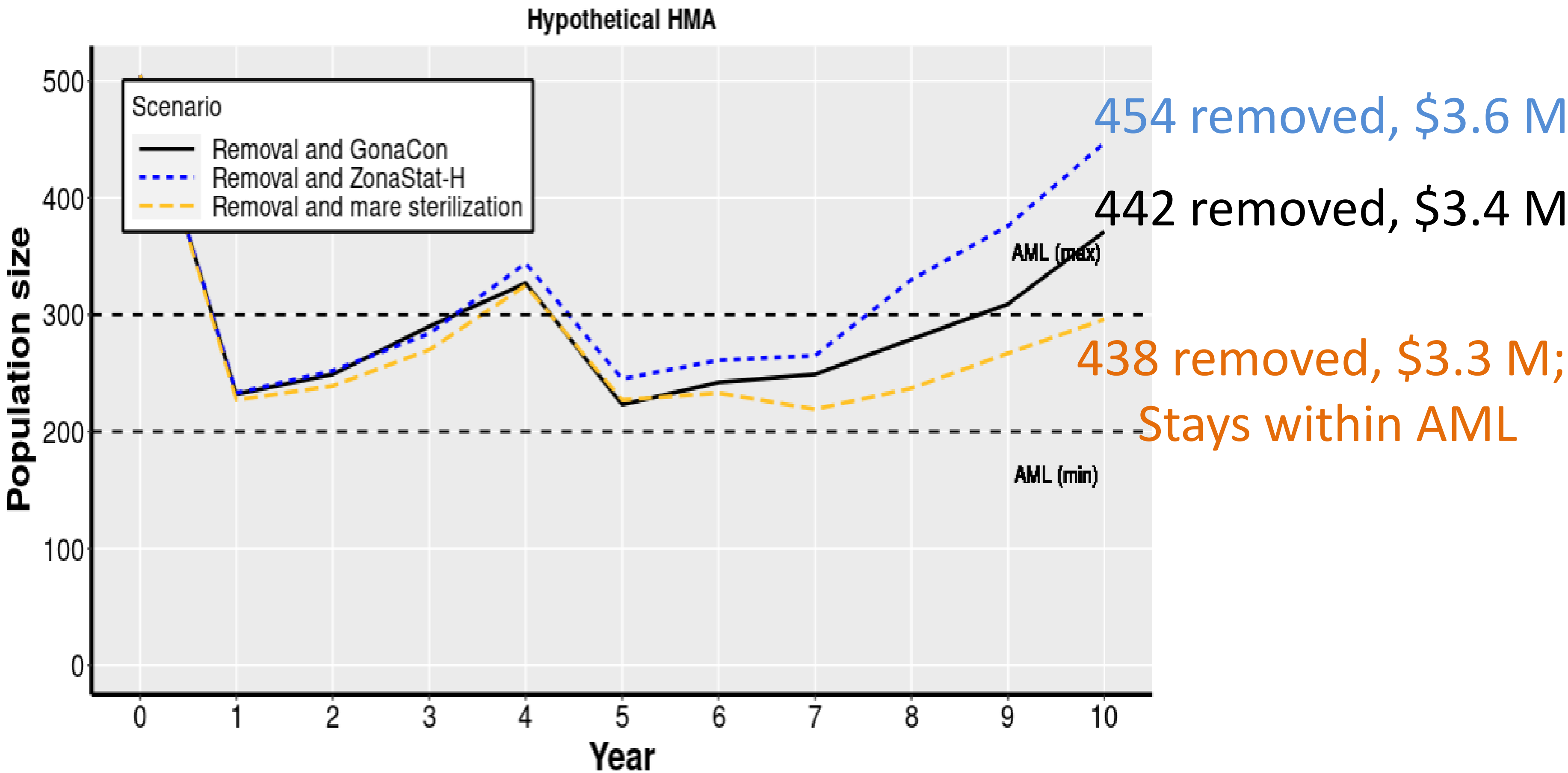
October 2021

Long-lasting fertility control can reduce gathers, handling, and costs; stay at AML



USGS PopEquus model (Folt et al. Unpublished). Gather & treatment in years 1 & 5.

PZP and GonaCon may cause sterility

BLM has _not_ used surgical mare sterilization for management or research

BLM must, by law, ensure self-sustaining populations of WHB

If a mare dies before she regains fertility, then even *"reversible" vaccines may cause sterility*

PZP vaccines can sterilize, shrink ovaries, and change hormone levels (i.e., Bechert et al. 2013, Joonè et al. 2017, Nuñez et al 2017)

PZP ZonaStat-H causes sterility after 4^{+} doses (Nuñez et al 2017)

A mix of different fertility control "tools" can be modeled

Choice of methods and percent treated will depend on HMA-specific goals and herd status

GonaCon Effectiveness

Theodore Roosevelt NP: mare fertility reduction (2009-2020)

Hand-injection, booster after 4 years *(Baker et al. 2018)*

1 dose ➔ only 37% & 28% reduction after 1 & 2 years

2 doses ➔ 100 to 80% reduction for 1-3 years (through 2017)

2 doses ➔ pretty good years 4-6 (through 2020) *(Baker at al. in prep.)*

Example: 14-year old mare who dies at 20 may be "sterile for life"

Darted, booster after 6-months to 2 years

80 to 50% reduction for 1-3 y.; over time *(Baker at al. in prep.)*

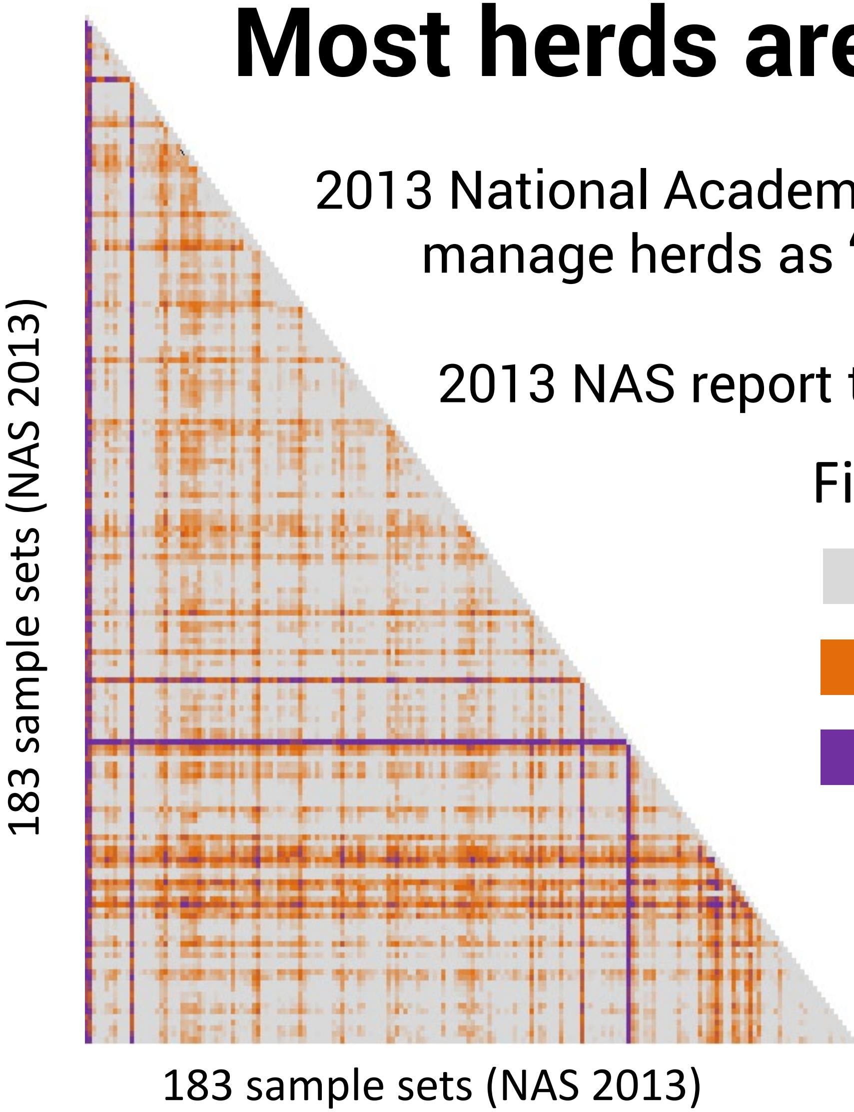
BLM management use, hand-injection, 30^{+}-day booster

Based on GPS radio-collar monitoring

Normal foaling first season after treatment (2021)

About 85^{+}% without foals in following season (2022)

Most herds are genetically similar



2013 National Academies of Sciences report said BLM should manage herds as “metapopulation(s)”

2013 NAS report table of Fst values from 183 sample sets

Fixation Index (Fst; differentiation)

- ~ 0.05 Virtually none*
- ~ 0.10 Very little*
- ~ 0.15 Elevated*

BLM monitors individual HMAs with genetic samples from gathers

*Frankham, R., J. D. Ballou, and D. A. Briscoe. 2010.
Introduction to conservation genetics, 2nd edition. Cambridge University Press, New York.

Potential Mare Fertility Control Studies

2021 Request for Proposals / Funding Opportunity

2022 ‘Wild Mare Fertility Control Research’ EA
Public comments received through August 22

A) Oocyte Growth Factor Vaccine (pen trial)

B) SpayVac PZP vaccine (pen trial)

C) iUPOD magnetic IUD trail (on-range study)

Exploratory: Vectored Fertility Control in Mice

(California Institute of Technology)

Develop and test ‘Juno’ binding protein [JBP]

Juno is a protein needed for sperm-egg fertilization

1. Protein Biochemistry / Molecular Biology

   Design & test high-affinity JBPs

   Make adenovirus-like viral vector that codes for JBP (in mice)

2. In Vitro

   Test the protein’s ability to prevent mouse egg fertilization

3. In Vivo

   Test virally-vectored JBP treatment to reduce mouse fertility

Viruses transfect muscular cells (like J&J COVID vaccine).
Cannot pass mouse-to-mouse. ***No horses in this study***.

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Future Climate (Examples)

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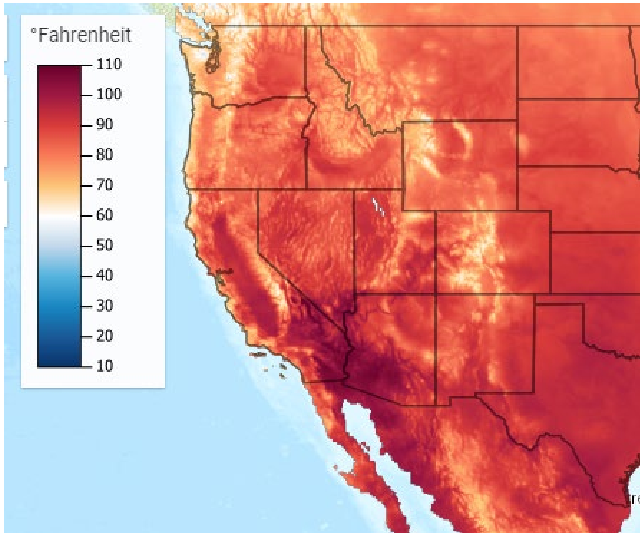
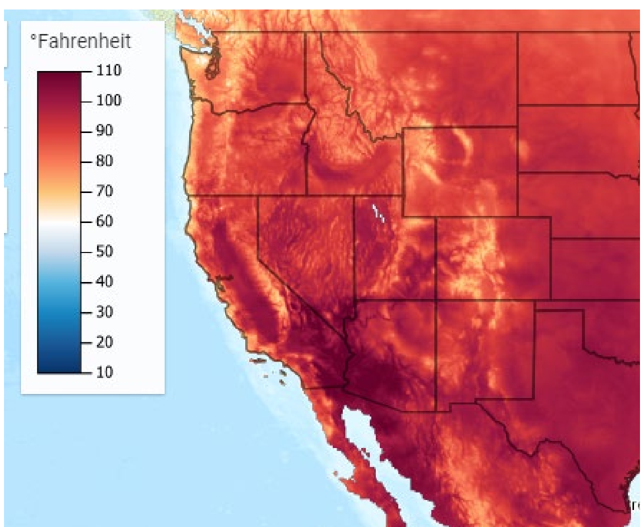


Study questions about WHBs and their environment that inform management

- How do WHB population densities affect the environment?
- How do environmental conditions affect WHB populations?

2040s



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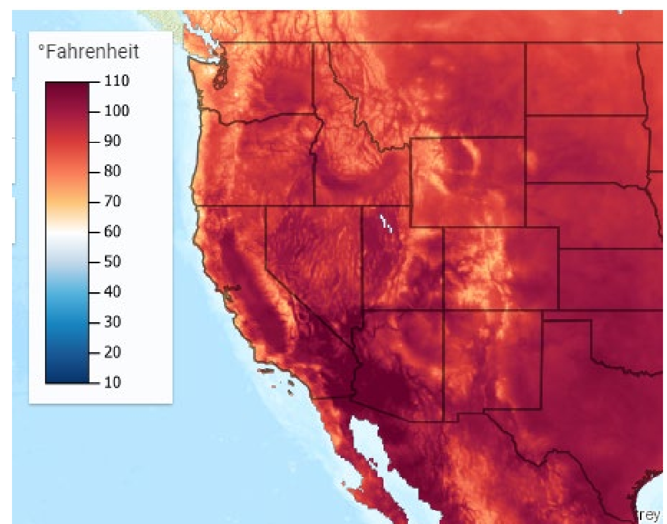


https://crt-climate-explorer.nemac.org/climate_maps

Interactions between WHB & the environment

<u>New projects</u>

"A protocol for predicting habitat resilience to climate change on WHB habitats" (Utah State University)

1. Develop a habitat index; identify 'usable space' in HMAs;
2. Use remotely-sensed measures to evaluate relationships between habitat conditions and herd sizes through time;
3. Produce 'resilience index' based on climate projections

"Livestock and wild horse influences on vegetation and wildlife in sagebrush ecosystems" (USGS)

Use a west-wide database to analyze effects of livestock, and of wild horses, on ecosystem health indicators: vegetation cover, biomass productivity, sage grouse and other sagebrush obligate bird population dynamics.

Permitted, non-funded projects (new since 2021)

"**Using social science to inform the BLM's Wild Horse and Burro Program's organizational capacity and scientific 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)
Study interactions between WHB, wetlands, vegetation, and predators. Project has no animal handling. Uses remote cameras, non-invasive plant sampling, drones to record vegetative conditions, and experimental scent applications.

"**Diet-microbiome interactions across ecologically diverse horse and burro populations**" (University of California, San Diego).
Assess microbial communities in gut flora across a range of environmental conditions.

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)

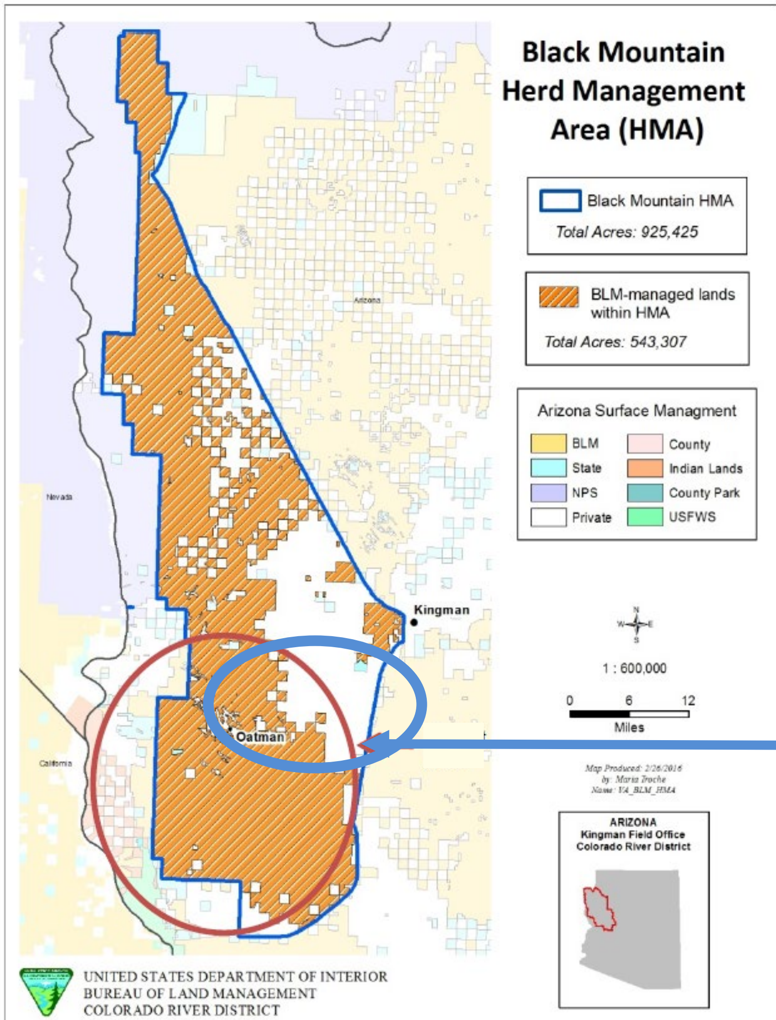
Schoenecker, K.A., S.R.B. King, and T.A. Messmer. 2021. The wildlife profession's duty in achieving science-based sustainable management of free-roaming equids. Journal of Wildlife Management 85:1057–1061.

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.*

"How much effort does it take to dart burros with PZP ZonaStat-H vaccine?"



Pilot project with Kingman FO and Humane Society of the United States

August 2017 – May 2022

Project area

Southern part of HMA: good access

Town of Oatman: habituated burros

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2021 Survey

Burro group observations
(dots)