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DIVISION ON EARTH AND LIFE STUDIES

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Using Science to Improve the BLM Wild Horse and Burro Program: A Way Forward

Public Webinar

June 2013

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Advisers to the Nation on Science, Engineering, and Medicine

National Academy of Sciences
National Academy of Engineering
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A WAY FORWARD



Report Released

June 5, 2013

Public Webinars

June 18 (11:00am EDT)

June 26 (1:00pm EDT)

**Webinars recorded and posted
at <http://dels.nas.edu/banr>.**

2009: Senate Committee on Appropriations instructs BLM to prepare “a new comprehensive long-term plan and policy.”

2011: BLM publishes proposed strategy for future management

- Science and Research is one of 7 topics
- Strategy includes commissioning a National Research Council report to “review earlier reports and make recommendations on how the BLM should proceed in light of the latest scientific research.”

National Research Council is the working arm of the National Academy of Sciences

- Created in 1916 to advise the federal government and advance science and technology
- Provides independent advice and scientific objectivity
- Committee members volunteer their time and expertise
- Study sponsors do not appoint committee members

Study Schedule

24-month study: June 1, 2011–May 31, 2013

6 information-gathering meetings between October 2011 and June 2012

- October 27-28, 2011, Reno, Nevada*
BLM, WinEquus, Wild Horse Management System, Genetics
- January 27-28, 2012, Spokane, Washington*
USGS Science Support of WHB Program, PZP Vaccine
- March 19-20, 2012, Irvine, California*
Predation, Fertility Control, Appropriate Management Levels
- May 3, 2012, webinar
SpayVac®
- May 14-15, 2012, Washington, DC*
Structured Decision-Making, Science Communication, Predation, Behavioral Ecology of Burros
- June 12, 2012, webinar
Management on the Sheldon National Wildlife Refuge

2 writing meetings

- August 9-10, 2012, Irvine, California
- October 18-19, 2012, Washington, DC

Committee Members

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Guy Palmer (Chair), Veterinary Science

Cheryl Asa, Reproductive Physiology and Contraception

Erik Beever, Range Ecology

Mike Coughenour, Ecosystems Modeling

Lori Eggert, Genetics and Conservation Biology

Bob Garrott, Wildlife Biology and Ecology, Population Ecology

Lynn Huntsinger, Range Ecology and Management

Linda Kalof, Sociology

Paul Krausman, Wildlife Biology and Ecology

Madan Oli, Population Demography and Modeling

Steve Petersen, Landscape Ecology

Dave Powell, Genetics and Reproductive Biology, Behavioral Ecology

Dan Rubenstein, Evolutionary Biology and Behavioral Ecology

David Thain, Equine Physiology, Veterinary Science

Conduct an independent evaluation of science, methodology, and technical decision-making approaches of the Wild Horse and Burro Program.

- Population Size and Growth Rates
- Population Processes
- Fertility Management
- Genetic Diversity
- Population Modeling
- Social Considerations
- Methods for Establishing and Adjusting AMLs



Conclusion: Ways to improve management practices on the range are available.

Bounds of the Study

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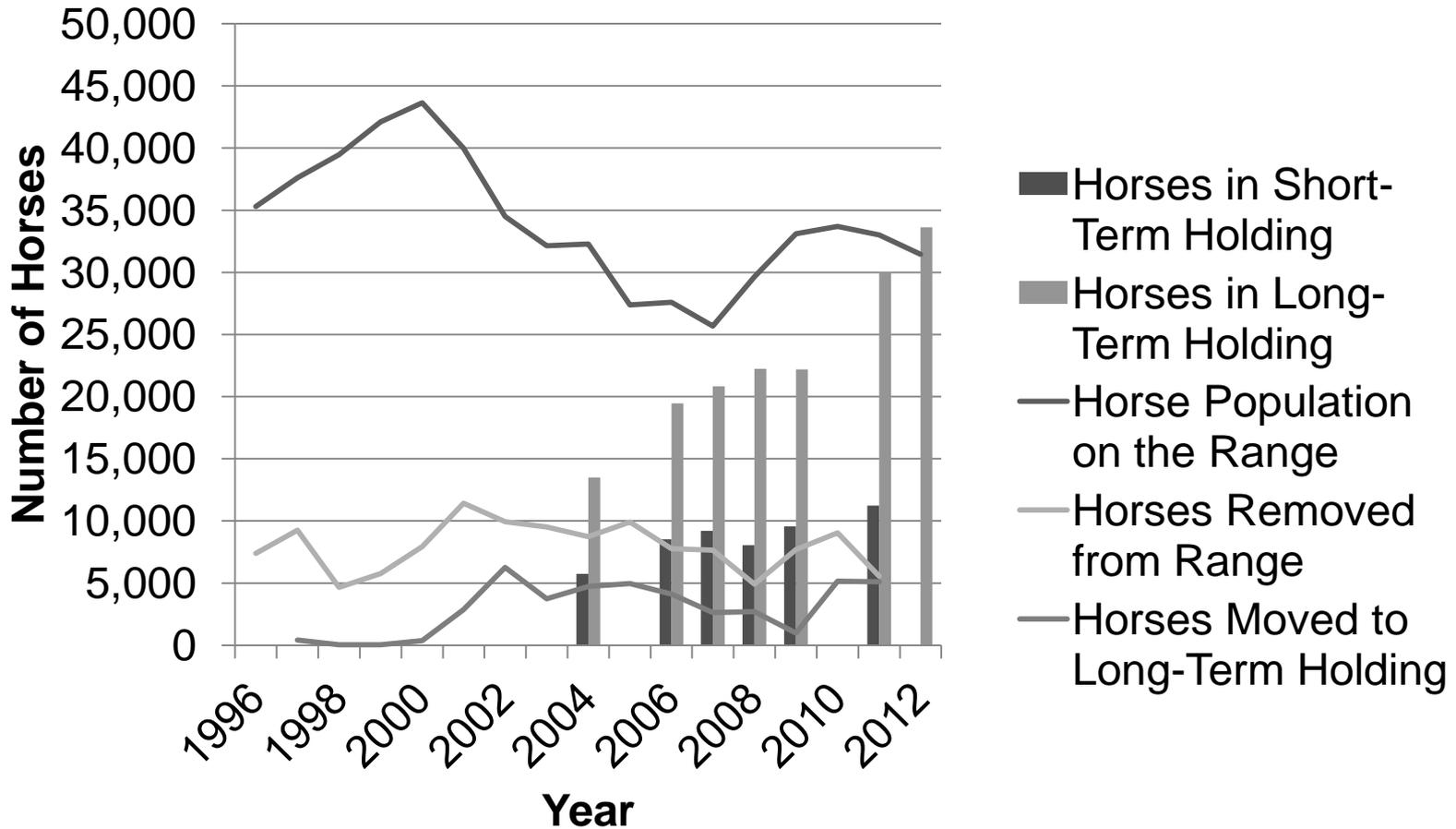
National Research Council committees are constituted to answer science-based questions.

Decision-makers weigh the values associated with possible outcomes of management actions.

Example: Science can inform what effects different strategies may have on free-ranging equid populations, but science cannot say what should be done.

In answering the statement of task on how BLM can use science to improve management of animals on the range, the report provides tools to help the agency decrease the use of contentious management practices and manage healthy populations on the range.

Horse Populations in Wild Horse and Burro Program



Source: Population-size estimates and numbers of animals removed and in holding facilities provided by BLM.

Business-as-Usual practices will continue to move more horses into long-term holding.

- Horse fecundity combined with gathers and removals will mean continued growth rates of 15-20%.
- With current growth rates, BLM will be unable to balance removals with adoptions.

Warehousing horses in long-term holding is not economically sustainable or acceptable to segments of the public.

- About half of FY2012 Wild Horse and Burro Program budget was spent on horses in long-term holding.
- Public discontent was expressed at committee information-gathering meetings and in written comments.
- If left to self-limit, competition for forage increases, which results in smaller quantities of forage available per animal, poorer body condition, and decreased birth rates and survival.

Tasks

- How accurately can horse and burro populations be estimated?
- What are the most accurate methods to estimate population size?
- Are there better techniques than those currently used by BLM?

Conclusion: Consistent surveying of populations with scientifically sound methods would increase credibility of population estimates.

Positive Steps Taken

- This work has already been started with USGS and should be continued.
- Coordination among neighboring HMAs helps improve data quality and interpretation of data.

Next Steps

- Continue work with USGS to identify and refine survey methods effective for the varied landscapes occupied by horses and burros
- Conduct surveys on standardized schedule
- Identify subset of HMAs to serve as sentinel populations
- Improve record-keeping on all population survey data through use of database accessible and used by all field offices
- Use database to capture survey data and removal data from field offices and from animal processing and holding facilities to generate annual program-wide statistics that connect the data collected to the statistics reported by the program
- Make survey data and modifications to data publicly available

Tasks

- Evaluate estimates of the annual rates of increase in populations.
- Is there compensatory reproduction as a result of population-size control?
- Would horse and burro populations self-limit if they were not controlled? If so, what indicators would be present?
- Is there evidence that predators alone could control population size?

Conclusions

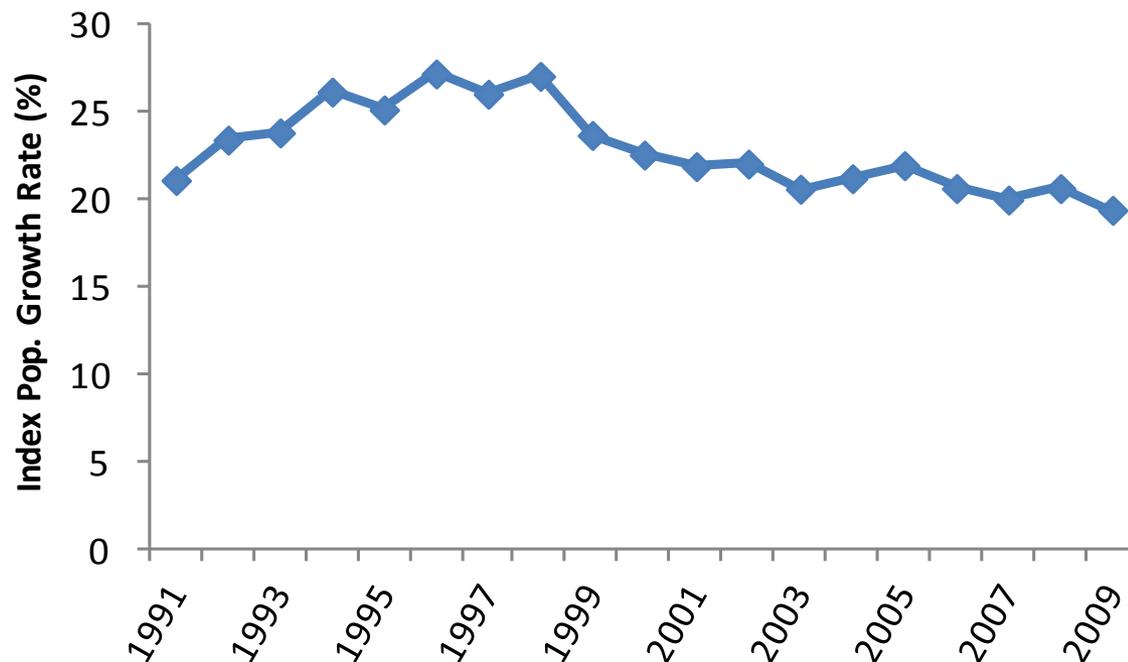
- Horse populations are growing at 15-20% a year.
- Management practices are facilitating high horse population growth rates.
- Predators will not typically control population growth.
- If left to self-limit, equid populations will do so primarily through increased competition for forage, which results in smaller quantities of forage available per animal, poorer body condition, decreased birth rates and survival, and increased impacts on the range.

Population Growth

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Index of Population Growth Rate of Free-ranging Horses



Source: Based on age data of 167,927 horses captured and removed from western rangelands in the United States. Removal information provided by BLM.

- Use analytical methods developed more recently to estimate population growth rates and associated measures of precision
- Conduct studies specific to burro population demography
- Study conditions of self-limited populations
- Improve understanding of feedbacks between vegetation systems and equid population growth

Tasks

- Evaluate information related to the effectiveness of fertility control methods to reduce population growth.
- What scientific and technical factors should be considered when managing herds with a reproducing and nonreproducing population of animals?
- When managing a herd with reproducing and nonreproducing animals, which options should be considered: geldings, vasectomized males, ovariectomized mares, or other interventions?
- Is there credible evidence to indicate that geldings or vasectomized stallions in a herd would be effective in decreasing annual population growth rates?

Conclusion: The most promising fertility-control methods are porcine zona pellucida (PZP) and GonaCon vaccines for females and chemical vasectomy for males.

- The most important criteria in selecting fertility-control methods are delivery method, availability, efficacy, duration of effect, and potential physiological and behavioral side effects.
- All 3 methods extend the breeding season but preserve the basic social unit and expression of sexual behavior.
- No fertility-control method has been developed that does not have some effect on physiology or behavior.
- **Comparing these methods to gathering and removal, they are no more disruptive and do not require the step of removal and relocation to holding facilities.**
- Using more than one control approach may be necessary because more than 50% of population must be treated to reduce population growth rates.

Fertility Management

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Advantages and Disadvantages to Most Promising Fertility-Control Methods

Method	Advantages	Disadvantages
PZP-22 and SpayVac®	Research and application in both captive and free-ranging horses Allows estrous cycles to continue so natural behaviors are maintained High efficacy Can be administered during pregnancy or lactation	Capture needed for hand injection of PZP-22 Extended breeding season requires males to defend females longer With repeated use, return to fertility becomes less predictable Out-of-season births are possible
Chemical Vasectomy	Simpler than surgical vasectomy Permanent No side effects expected Normal male behaviors maintained Should have high efficacy	Requires handling and light anesthesia Permanent Only surgical vasectomy has been studied in horses, so side effects of the chemical agent are unknown Extended breeding season requires males to defend females longer and may result in late-season foals if remaining fertile males mate Only surgical vasectomy has been studied in horses, so efficacy rate is unknown
GonaCon™ for Females	Effective for multiple years Sexual behavior exhibited Social behaviors not affected in the single field study	Capture may be needed for hand injection of initial vaccine and any boosters Lower efficacy than PZP-vaccine products, especially after first year Sexual behavior may not be cyclic, inasmuch as ovulation appears to be blocked Should not be administered during early pregnancy because abortion could occur Few data on horses

- Increase understanding of the percentage and duration of efficacy and the extent of reversibility for PZP-22, SpayVac®, and GonaCon™
- Evaluate the extent to which females treated with GonaCon continue to exhibit sexual behavior
- Assess the efficacy and safety of potential agents for chemical vasectomy
- Study the effects on male health and body condition of having to compete and defend contracepted females
- Consider alternative methods to gathering for delivery of contraceptives, such as trapping near water sources
- Use liquid PZP as interim fertility-control method until longer-acting methods are available

Tasks

- What does information available on horse and burro herd genetic diversity indicate about long-term herd health?
- What management actions can be undertaken to achieve an optimal level of genetic diversity?
- What scientific factors should be considered when making population control decisions relative to the effectiveness of control approach, herd health, genetic diversity, social behavior, and animal well-being?

Conclusions

- **Management of equids as a metapopulation is necessary for the long-term genetic health of horses and burros at the HMA or HMA-complex level.**
 - Genetic diversity provides the raw material needed to respond to environmental changes.
 - **Genetic diversity of most horse herds is comparable to that of healthy mammal populations.**
 - Mean heterozygosity and allelic diversity of today's herds are appropriate targets of genetic diversity.
- **Phenotypic data have not been recorded and integrated into genetic management of free-ranging populations.**
 - Recording the occurrence of diseases and clinical signs and the ages and sexes of the affected animals would allow BLM to monitor the distribution and prevalence of genetic conditions.

Next Steps

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- Continue to monitor genetic diversity as part of routine management of horses and burros
- Collect and analyze samples at all gathers to detect losses of genetic diversity
- If genetic diversity is statistically significantly lower in subsequent surveys of an HMA, the HMA should be prioritized for genetic management
- Document anomalies that may indicate the presence of deleterious mutations during gathers
- Consult with geneticists and equine veterinarians in cases where phenotypic data suggest genetic disorders
- Examine the genetic constitution of herds with Spanish bloodlines or unique morphological traits to make sure genetic purity is not maintained at the expense of genetic diversity

Tasks

- Evaluate the strengths and limitations for models for predicting impacts of horse populations.
- What types of decisions are most appropriately supported using WinEquus?
- Are there additional models BLM should consider for future use?

Conclusion: Input parameters used in WinEquus are not transparent, and it is unclear whether or how results are used in management decisions.

- Given appropriate data, WinEquus can adequately simulate horse population dynamics under management actions of no action, removal, female fertility control, and a combination of removal and fertility control.
- WinEquus results depend heavily on values of input parameters and options selected by user for simulations.
- Values and selections are not typically provided in gather plans and environmental assessments.
- Majority of gather plans conveyed nothing about whether or how results were used.

Conclusion: A more comprehensive model or suite of models could help BLM to address and adapt to challenges related to management of horses and burros on the range, management of animals in holding facilities, and program costs.

- A suitable modeling framework could inform short-term and long-term management plans.
- It would simulate life history, social behavior, mating system and genetics, forage limitation, and use of forage, water, and space.
- It could evaluate whether and to what extent stated management objectives are achievable under current or projected funding situations and what the most effective or cost-effective management options are to achieve the objectives.

- **Clear description of input parameters and a detailed description of WinEquus options selected by user would help the general public determine the reliability of WinEquus results.**
- **A clear explanation of whether or how results of population modeling were used would improve transparency with the public.**
- **Efforts should be made to use data from targeted HMA or HMA complex or from a sentinel population that resembles the target population being modeled.**
- **Future modeling efforts should be based on rigorous and reliable estimates of demographic and management parameters within an adaptive management framework.**

Tasks

- Evaluate BLM's approach to establishing or adjusting AML as described in the 4700-1 Wild Horses and Burros Management Handbook.
- Based upon scientific and technical considerations, are there other approaches to establishing and adjusting AML BLM should consider?
- How might BLM improve its ability to validate AML?

Conclusion: The handbook lacks the specificity necessary to guide managers adequately in establishing and adjusting AMLs.

- More specificity and consistency in its protocols for establishing and adjusting AMLs is needed. Terms should be defined explicitly and used precisely.
- A scientific approach to identifying the constraints of equid population levels on rangeland natural resources, other species, and other uses should be developed.
- Direct forage-production measures should support production levels inferred by visual estimates of forage use, back-calculations of offtake, or assumed animal intake.
- Transparent processes for forage allocation should be developed, such as participatory adaptive approaches.

Conclusion: The handbook does not clarify the vague legal definitions related to implementing and assessing management strategies for free-ranging equids.

- The scientific meaning of terms such as “thriving natural ecological balance” and “rangeland deterioration” need to be determined.
- Developing a sustainability or ecosystem resilience framework may be helpful in establishing and setting AMLs; however, these concepts need to be further defined and scientifically tested.

Conclusion: How AMLs are established, monitored, and adjusted is not transparent to stakeholders, supported by scientific information, or amenable to adaption with new information and environmental and social change.

- Standardized monitoring of grazing utilization, rangeland ecological condition and trend, actual use and climate data, and use of NRCS ecological site descriptions would improve the usefulness and quality of ecological information agency-wide and build on previous work in the National Resource Inventory database.
- Extreme environmental events need to be planned for; flexibility in numbers, timing, and boundaries are potential ways of coping.
- Setting and adjusting AMLs should use an adaptive-management process.

- **Inventory the landscape to assess current states of ecosystem quantitatively and qualitatively**
- **Develop conceptual models and hypotheses for the processes that have led to the current states, differentiating the roles of climate, horses and burros, livestock, wildlife, and other factors**
- **Develop predictions of future changes based on conceptual and quantitative models, particularly those that occur in response to alternative management practices**
- **Develop monitoring approaches to assess the success of adopted management approaches in bringing about predicted change**
- **Refine models to improve accuracy and predictive power in setting AMLs**
- **Provide transparent information about data and decision-making process to stakeholders and obtain their responses**

- **Measure forage production directly**
- **Develop approaches for quantitatively distinguishing horse and burro use from livestock and wildlife use of forage, riparian areas, and other resources**
- **Monitor ecological condition in selected locations to assess equid effects (e.g., patch creation, compaction of soil, trampling vegetation) on ecosystem resilience**
- **Monitor water quality in addition to water supply**
- **Use a system of strategically placed, long-term and temporary exclosures to quantify the long- and short-term effects of free-ranging equids, livestock, and wildlife for different population levels, HMAs, seasons, and weather conditions**

Task

- **What are some options available to BLM to address the widely divergent and conflicting perspectives about horse and burro management and to consider stakeholder concerns while using the best available science to protect land and animal health?**

Conclusions

- **Resolving conflicts with polarized values and opinions regarding land management rests on the principles of transparency and community-based public participation and engagement in decision-making.**
- **Decisions of scientific content will have greater support if they are reached through collaborative, broadly based, integrated, and iterative analytic-deliberative processes that involve both the agency and the public.**

- 1) **Consistent surveying of populations with scientifically sound methods would increase credibility of population estimates.**
- 2) **Using a modeling framework that captures more management practice options and related financial implications would provide better predictions of management practice outcomes.**
- 3) **A more comprehensive modeling framework could help in designing a herd-specific contraceptive treatment plan to meet management goals.**
- 4) **Managing some herd populations as a single population would help maintain genetic diversity.**

- 5) Improving the connection of AML establishment and adjustment to results of scientific research will improve the operation and image of the Wild Horse and Burro Program.
- 6) Improved record-keeping and transparency of data will help to increase public confidence in the Wild Horse and Burro Program.
- 7) A commitment to public participation will help BLM address divergent and conflicting views about free-ranging horse and burro management.

Science cannot transform how BLM is perceived by all members of the public, but a scientific underpinning for its decisions would help BLM to explain its management actions.

A New Approach

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More intensive, science-based management of horses and burros would be required.

- Intensive management has been successful on Assateague Island and Shackleford Banks.
 - These locations have advantages over most HMAs but are examples of how intensive management can work.
 - This approach would require commitment to a widespread, consistently applied strategy of fertility control.
- Identifying sentinel populations and HMAs that represent diverse ecological settings would be cost-effective and scientifically sound.
 - Intensive study of sentinel populations would improve assessment of population dynamics and ecosystem responses to changes in animal density, management interventions, and variations in seasonal weather and trends in climate.
 - Research on populations and ecosystems already conducted by USGS is a step in this direction that should be continued.

More intensive, science-based management of horses and burros would be required.

- In the long term, more intensive management using fertility control is likely a more affordable option than continuing to remove horses to long-term holding facilities.
- Intensive management would benefit from a commitment by BLM to support an integrated team of competent, dedicated scientists.
- Using social science to proactively identify issues around the intensive management of equids may reduce tension with parties interested in horses, burros, and multiple uses of public lands.

A Way Forward

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There is consensus that current management conditions of horses and burros are not sustainable.

Short-term, more intensive, science-based management of horses and burros will be expensive, but addressing the problem immediately with a long-term view will be more affordable than continuing current management practices.

Ways to improve management practices on the range are available; if implemented broadly and consistently, they could help the Wild Horse and Burro Program better meet its multiple mandates while also cultivating public confidence.

Thank you.

The report is available online at www.nap.edu.

