November 30, 1999

REPORT OF THE ARIZONA BURRO CENSUS TEAM TO THE BLM ARIZONA STATE LEADERSHIP TEAM

INTRODUCTION

A subgroup of the Arizona Burro Team was tasked with reviewing available census methodologies for estimating populations of wild burros in Arizona by herd area and making appropriate recommendations to the BLM Arizona State Leadership Team. The BLM members of the Burro Census Team included:

Dave Little, ASO, organizational lead
Kelly Grissom, ASO, technical lead
Roger Oyler, YFO, technical specialist
Cindy Barnes, LHFO, technical specialist
Scott Elefritz, KFO, technical specialist
John Christensen, KFO, management representative
Gail Acheson, YFO, management representative
Lili Thomas, National Wild Horse and Burro Staff, Reno

Much of the concern for census techniques results from past differences of professional opinion between BLM and the Arizona Game and Fish Department (AzG&F) about both the census techniques used and the resulting estimates of wild burro populations. Therefore, the Team invited participation by representatives of the AzG&F. The AzG&F participants included:

John Hervert, Yuma
Ray Lee, Phoenix
Art Fuller, Kingman
Matt Pierce, Wickenburg
Stewart Kohnke, Salome

Three meetings of the combined group were held during the Fall of 1999. The following report is a summary of the deliberations of the combined group and the consensus recommendations from the combined group.

REVIEW OF EXISTING CENSUS DATA

The group summarized the existing census data by herd management area as portrayed in Attachment 1.

REVIEW OF EXISTING CENSUS TECHNIQUES

The group reviewed census techniques that had been used in Arizona or which have been described in the scientific literature and which appeared to have potential application for estimating wild burro populations. For each method reviewed, the team considered the:

1) acceptance by the scientific community,
2) statistical reliability,
3) affects on employee safety,
4) affects on the safety of the animals being counted,
5) relative cost effectiveness and
6) acceptance by the Bureau's partners.

This discussion and the resulting literature research conducted by individual team members resulted in the summary information portrayed in Attachment 2. Portions of the information in the summary, such as acceptance by the Bureau's partners, is still incomplete because the group quickly agreed that there were some techniques that were obviously not suitable and were, therefore, not discussed in detail. The Mark and Resight technique, using animals marked by paint balling from a helicopter, was determined to be one of the most accurate available and is supported by the AzG&F. However, it is not acceptable to BLM managers because of concerns for the safety of both employees and the burros. The Thermal Infra-Red technique was not discussed in detail but some of the BLM participants felt it may be useful in some situations while the AzG&F representatives had serious reservations. Because of these differences of opinion, the group chose to focus on several other techniques where there was consensus that they appeared to hold particular promise. If these latter techniques are later determined to be unsuitable, the application of the Mark and Resight and the Thermal Infra-Red techniques can be revisited.

DEVELOPMENT OF PROPOSALS

There was a consensus that the Simultaneous Double-Count technique used in Australia appeared to be a cost effective way of improving the accuracy of counts by reducing the observer bias. However, there were concerns about the situations in which it may be useful because the technique does not increase the reliability of detecting animals not visible because they are screened by vegetation or terrain.

Dr. Francis Singer from the Biological Resources Division of the USGS in Fort Collins, Colorado, was invited to present the results of his work in developing techniques for estimating populations of elk and big horn sheep in Idaho, Utah, Colorado and Yellowstone National Park. Dr. Singer suggested that the Sightability Model, first developed in Idaho for elk, may provide a cost effective, repeatable and statistically reliable method for estimating populations of wild burros. The group agreed that this technique appeared to be worth pursuing and asked Dr. Singer to prepare a proposal for how a similar model might be developed for wild burros in Arizona.

The BLM field office representatives worked with their counterparts in the AzG&F to develop preliminary census proposals for FY 2000 in the Cibola-Trigo and Alamo herd management areas. These two areas are high priority for updating wild burro census information and are both scheduled for gathers during FY 2000. The group tentatively agreed to recommend applying the Simultaneous Double-Count technique both before and after the planned gathers to determine how well the technique would detect the removal of a known number of wild burros from each area and how applicable the technique may be in different habitat types and terrains.

At the final meeting the group discussed Dr. Singer's proposal for developing a Sightability Model for wild burros in Arizona and the preliminary FY 2000 census proposals for the Cibola-Trigo and Alamo herd management areas. The proposals were then modified and refined based on the collective input of the combined group. These two proposals then became the basis for the recommendations of the group as described below.

RECOMMENDATIONS

The consensus recommendations of the combined BLM and AzG&F Burro Census Team are as follows:

A. Short-Term

1) For the next census cycle for the Black Mountain HMA, propose to the Black Mountain coordinating group that there be a standard direct aerial count with an extrapolation to an estimated total population by using a sighting index established by previous mark/resight censuses.

2) During FY 2000, test the applicability of the Simultaneous Double-Count census technique to conditions and habitats in Arizona. To validate the applicability of this method, Dr. Singer suggested that we do at least two tests. The group agreed that this would be desirable, but there was concern about the potential cost of the second test and whether we would gain enough additional information from the second test to justify this additional cost. Therefore, the recommendation of the team is as follows:

   a) That the primary test be a pre/post census of the Cibola capture area (summer gather). BLM will furnish the aircraft and BLM and AZ G&F will each provide at least one aerial observer. The Yuma FO will work with John Hervert to prepare a detailed plan for the census.

   b) That for the second test a smaller operational census team (Elefritz/Barnes/Hervert) explore whether there is an opportunity in the Alamo HMA to use funding already scheduled for the Alamo census this

year. The test would be conducted before and after the gather for the Alamo HMA scheduled for mid-January, 2000. Considering the limited time and funds available, the team will explore using a stratified sample for the simultaneous double-count. BLM would provide the aircraft and as above BLM and AZ G&F would each provide at least one observer.

c) Francis Singer would participate in the census of the Alamo HMA to help get him familiar with the area where the sightability model would be developed (see the long-term recommendation below).

3) Kelly to work with the Phoenix Field Office and John Hervert to develop a proposal for conducting the censuses needed for the Harquahala, Little Harquahala and Painted Rock wild burro populations.

B. Long-Term Never got here!

The group agreed that the development of an Idaho-type Sightability Model holds the best long-term hope for a census technique for wild burros that meets the basic criteria of being statistically reliable, acceptable to both managers and the scientific community, safer for both employees and the animals, and more cost effective. The group, therefore, recommends that:

1) The model be developed in the Three Rivers Complex (Havasu, Alamo and Big Sandy Herd Management Areas).

2) A design team prepare a detailed plan for developing the model. Members of the initial design team will include the BLM and AZ G&F specialists on the current team (i.e., Roger, Cindy, Scott and John Hervert) and Francis Singer. Representatives of others Field Offices (e.g., Phoenix) will be invited to join the design team. Other agencies (e.g., FWS and NPS) will be informed of the census model development and also will be invited to join the team developing the model.

3) The design team prepare by about the end of February, 2000, an initial draft of the plan for developing the model. Based on information provided by Dr. Singer, this would likely be a three year project.

4) Kelly coordinate with the national office to secure funds for BLM's portion of the costs of developing the model. Dr. Singer will continue to pursue funding for their portion of the costs from within the BRD budget.

As plans for both the short- and long-term proposals proceed, the group recommends that both BLM and AZ G&F aggressively pursue opportunities to involve and inform the public, other land managing partners, and interested public-interest groups during the development of the

land managing partners, and interested public-interest groups during the development of the proposals and as the proposals are implemented.

It is further recommended that, when conducting the tests of the Simultaneous Double-Count technique and developing a Sightability Model, the information and data be developed at a quality to allow for publication in scientific journals.

No further meetings of the Burro Census Team are currently planned. As new issues arise or new assignments are given by the leadership of BLM and AZ G&F, the group can be called back together as needed.

Signed:

11/30/99

David E. Little, BLM Organizational Lead

11/30/99

William K. Grissom, BLM Technical Lead

The above recommendations are:

☐ approved as described

☐ approved with the following modifications:

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State Director

SUMMARY OF BURRO CENSUSES IN ARIZONA

Herd Area Alamo

Year	Census Technique Used	Time of Year	Results	Any Comments (type of aircraft, time of day, any special conditions or observations, etc.)
1974	Total Count	8/27-12/14	695 count	helicopter corrected using tape & photos From Wild Free-Roaming Horse & Burro Inventory Technical Report (1975)
1976	Total Count	July	395 count	helicopter From Alamo HMAP
1977	Mark - Resight	?	1200 estimate	helicopter From Alamo HMAP
1980	Mark - Resight	?	450 estimate	helicopter From Lower Gila North Grazing EIS
1989	Mark - Resight	June 9-14	106 count = 156 estimate	helicopter partial count - Bill Williams River to Alamo Dam; 56 animals marked, 38 recounted for 68% resight rate
1991	Mark - Resight	Sept 9-18	186 count = 238 estimate	helicopter The full count (307) included Alamo & Big Sandy HMAs 130 animals marked, 85 recounted for 65% resight rate

Census Techniques include:

- Total Count
- Total Count with application of Index
- Mark - Resight
- Sample
  - Transect
  - Grid
  - Quadrat
- Pre - and Post -Capture Count
- Thermal IR
- Other

September 2, 1999

SUMMARY OF BURRO CENSUSES IN ARIZONA

Herd Area Cibola-Trigo HMA Arizona

Year	Census Technique Used	Time of Year	Results	Any Comments (type of aircraft, time of day, any special conditions or observations, etc.)
1974	Total Count	August thru December	124 burros 33 horses	B1 Helicopter From Wild Free-Roaming Horse and Burro Inventory Technical Report, 1975
1984	Mark-Resight	June	372 burros	B2 Helicopter 62% sighting ratio of marked burros Horses not counted
1989	Mark-Resight	June	351 burros	B2 Helicopter 79 % sighting ratio of marked burros Horses not counted
1999	Thermal IR	July	591 to 749 burros	Report being prepared. Technique did not count horses with reliability it did burros.

Census Techniques include:

- Total Count
- Total Count with application of Index
- Mark - Resight
- Sample
  - Transect
  - Grid
  - Quadrat
- Pre - and Post -Capture Count
- Thermal IR
- Other

September 2, 1999

SUMMARY OF BURRO CENSUSES IN ARIZONA

Herd Area Cibola-Trigo HMA California

Year	Census Technique Used	Time of Year	Results	Any Comments (type of aircraft, time of day, any special conditions or observations, etc.)
1974	Total Count	August thru December	25 burro	B1 Helicopter From Wild Free-Roaming Horse & Burro Inventory Technical Report (1975)
1984	Mark-Resight	June	276 Burros	B2 Helicopter Wild Burro Inventory July 1984
1996	Thermal IR	July	175-180 Burros	FLIR technology, transects consisted of orbits 1 mile in diameter throughout the area

Census Techniques include:

- Total Count
- Total Count with application of Index
- Mark - Resight
- Sample
  - Transect
  - Grid
  - Quadrat
- Pre - and Post -Capture Count
- Thermal IR
- Other

September 2, 1999

SUMMARY OF BURRO CENSUSES IN ARIZONA

Herd Area Havasu (AZ)

Year	Census Technique Used	Time of Year	Results	Any Comments (type of aircraft, time of day, any special conditions or observations, etc.)
1974	Total Count	Sept ?	166 count	helicopter corrected using tape & photos From Wild Free-Roaming Horse & Burro Inventory Technical Report (1975)
1974	Total Count	Sept 16-24	178 count	helicopter 18 collared, 8 collared resighted = 44% resight rate From Wild Free-Roaming Horse & Burro Inventory Technical Report (1975)
1976	Total Count	July 12-14	302 count x 2.5 = 755 estimate	helicopter? From Havasu HMAP
1977	Total Count	June 20-23	195 count	helicopter recommended future flight between July 10-31
1980	Total Count with Index	Nov 18-24	70 count x 2.5 = 175 estimate	helicopter
1984	Total Count with Index	June	76 count x 1.63 = 124 estimate	helicopter index of 1.63 from Yuma Mark-Resight census conducted at same time
1989	Mark - Resight	June 7-11	23 count = 23 estimate	helicopter original 14 marked were all seen on recount for 100% resight rate

Census Techniques include:

- Total Count
- Total Count with application of Index
- Mark - Resight
- Sample
  - Transect
  - Grid
  - Quadrat
- Pre - and Post -Capture Count
- Thermal IR
- Other

September 2, 1999

SUMMARY OF BURRO CENSUSES IN ARIZONA

Herd Area Havasu (CA)

Year	Census Technique Used	Time of Year	Results	Any Comments (type of aircraft, time of day, any special conditions or observations, etc.)
1974	Total Count	Sept ?	204 count	helicopter corrected using tape & photos From Wild Free-Roaming Horse & Burro Inventory Technical Report (1975)
1974	Total Count	Sept 16-24	164 count	helicopter 9 collared, 4 collared sighted = 44% resight rate From Wild Free-Roaming Horse & Burro Inventory Technical Report (1975)
1977	Total Count	July 12-14	253 count	helicopter
1984	Total Count with Index	June	223 count x 1.63 = 363 estimate	helicopter index of 1.63 from Yuma Mark-Resight census conducted at same time

Census Techniques include:

- Total Count
- Total Count with application of Index
- Mark - Resight
- Sample
  - Transect
  - Grid
  - Quadrat
- Pre - and Post -Capture Count
- Thermal IR
- Other

September 2, 1999

SUMMARY OF BURRO CENSUSES IN ARIZONA

Herd Area Black Mountain

Year	Census Technique Used	Time of Year	Results	Any Comments (type of aircraft, time of day, any special conditions or observations, etc.)
1981	Mark - Resight	May	Lincoln/Peterson N=1,933 Sighting Rate = 48.5%	Bell 47G3B1 66 hours of flight time
1986	Mark - Resight	June	Lincoln/Peterson N=1,046 Sighting Rate = 77.6%	Bell 47G3B2 63 hours of flight time not total recount in phase 2
1991	Mark - Resight	June	Lincoln/Peterson N=1,228 Sighting Rate = 53.1%	Hughes 500D 109 hours of flight time
1994	Mark - Resight	June	Lincoln/Peterson N= 909 Sighting Rate = 51.7%	Hughes 500D
19__	Mark - Resight	April	Lincoln/Peterson N=662 Sighting Rate = 48.4%	Bell 201B 60 hours of flight time

Census Techniques include:

- Total Count
- Total Count with application of Index
- Mark - Resight
- Sample
  - Transect
  - Grid
  - Quadrat
- Pre - and Post -Capture Count
- Thermal IR
- Other

ATTACHMENT 2

SUMMARY OF CENSUS TECHNIQUES FOR WILD BURROS IN ARIZONA

Part I: Census Techniques That May Have General Applicability

	Sight/Resight Lincoln-Peterson Index	Thermal Infrared	Simultaneous Double-Count	Sighting Probability Model
General Description	Two inventories are conducted and a sighting rate is developed which is the percent of the total population observed. The first inventory is to capture/mark/ release animals. The second inventory is to count the population noting the marked animals verses unmarked animals observed.	Generally done using fixed wing aircraft with a forward looking infrared sensor. Can fly straight line transects or orbital transects to search for target animals. Results can be taped for enhancement and review. Critical aircraft crew include the pilot and sensor operator.	Two observers in a plane independently record animals observed in the same sample area to eliminate observer bias in estimating the population.	Radio collars are placed on a known number of animals. An aerial count is made and a model is developed based on the number of radio collared animals included in the observed sample. This model is applied to future counts without further marking animals.
Acceptance by the Scientific Commun-ity	The Lincoln-Peterson Index has been utilized within the scientific community for determining population sighting rates for many years. It is one of the simplest techniques available to derive population estimates.	Relatively new technique for surveying large ungulates and has yielded mixed results. The technique has not been as thoroughly tested and studied as other methods.	Has been published in the Journal of Wld. Mgt. The most recent article concerned estimation of feral burros and horses in Australia.	This approach is commonly used in estimating ungulate population size from aerial surveys. Models are applicable to the areas in which they were derived.
Statistical Reliability	[We need to determine how we are going to describe statistical reliability]	More information is needed before this can be determined.		

	Sight/Resight Lincoln-Peterson Index	Thermal Infrared	Simultaneous Double-Count	Sighting Probability Model
Employee Safety	Low: Helicopter flies 10 - 20 ft AGL. Pilot focuses on staying on top of fleeing burro taking evasive action.	High: Employees are not part of the critical crew and would not be involved in flights. Also, operational altitudes are generally at about 2,000 ft AGL, well above special use flight restrictions.	Moderate: Aircraft would fly at 200 ft. AGL. Pilot error is less likely to contribute to an accident.	Moderate: Aircraft would fly at 200 ft. AGL. Pilot error is less likely to contribute to an accident. Capture operations for fitting animals with radio collars need not be hazardous if corral traps and wranglers are used. Hazards would increase if aerial capture methods such as netting are used.
Affect on Animals	High: Animals have been injured or killed when trying to escape a low flying aircraft as they try to escape at full flight over rough terrain.	None: Due to the altitude of flight operations, the animals are not disturbed at all. They maintain normal activities.	Low: Movement of animals as a result of low flying aircraft will be infrequent and when they do occur, short in duration.	Low for subsequent counts: Movement of animals as a result of low flying aircraft will be infrequent and when they do occur, short in duration. Capture and fitting animals with radio collars will subject animals to possible injury, though the likelihood is equal to a gather operation.

	Sight/Resight Lincoln-Peterson Index	Thermal Infrared	Simultaneous Double-Count	Sighting Probability Model
Relative Cost	High: Requires two inventories over the same area and requires the use of the more expensive aircraft.	Moderate: Although there is currently only one vendor, may be more cost effective than some and not others. There is minimal data on which to base costs.	High: Requires only a single survey. Aircraft will fly line transects, thereby facilitating efficient coverage of the area represented by the survey. Flight time is not used to mark animals or confirm marks on animals.	Moderate: High initial costs during the process of developing the model. After the model is completed, only a single survey is required in order to derive a population estimate. Aircraft will fly line transects, thereby facilitating efficient coverage of the area represented by the survey.
Acceptance by Partners (including Az BLM, Az G&F Dept., other BLM offices, etc.	[To be determined after all relevant information is available]			

	Sight/Resight Lincoln-Peterson Index	Thermal Infrared	Simultaneous Double-Count	Sighting Probability Model
Remarks	Most other census techniques that determine sighting rates are based on the Lincoln-Peterson Index. Sinoff et al, 1982, observed "It is interesting that resight rates were so similar between Walker and Ohmart's 1977 census and the recent census; 51% and 54% respectively. If the resight rate for a given area remains relatively constant, marking could be dispensed with once a correction factor had been established. Then the subsequent counts could simply be total counts adjusted by the correction factor. The savings in helicopter time and man-hours would be substantial."	More information is needed on reliability and costs.	This method attempts to reduce the bias among observers but will not estimate animals that are missed because they are hidden from view (e.g., under trees or behind hills). Az G&F Dept. currently uses this method to estimate mule deer, javelina and bighorn sheep. It is recognized as a very conservative estimator that should be used after it is calibrated with a more reliable method.	The Az G&F Dept. recognize this as an acceptable population estimator. Several western states currently use this method of population estimation.

Part II: Census Techniques That May Be Applicable in Special Situations

	Ground Counts	Removal Method	Pre- and Post-Gather	Complete Count (Total Count)
General Description	Observers are placed on the ground to record all visible animals.	Involves total removal of all burros within a designated area, counting the animals, and subsequently releasing all or a known number of the animals. Animals are removed using standard removal techniques.	A census (direct sighting) is conducted immediately prior to a removal operation. The removal is accomplished and a second census is conducted, as similar to the first as possible. A relationship between the results of the two counts and the number of animals removed is established, and a sighting rate and population estimate are derives. The relationship between the results of these inventories is expressed as follows: $N = X_1 R / (X_1 - X_2)$ and $P = (X_1 - X_2) / R$ where N = estimate of pre-removal population R = number of animals removed X_1 = number of animals observed in pre-removal census X_2 = number of animals observed in post-removal census P = sighting rate	Predetermined flight patterns are flown over a defined geographic area with a goal of recording each burro currently located in the area. Requires that biological units be treated as one management area and that the count be conducted in one time-frame to avoid double counting animals.

	Ground Counts	Removal Method	Pre- and Post-Gather	Complete Count (Total Count)
Acceptance by the Scientific Commun-ity	Counting entire animal populations by individuals on the ground in large areas is extremely difficult. Little work within the scientific community has been conducted on this type of census for large dispersed populations.	Is accepted within the scientific community.	Accepted as a valid method for developing a population estimate and sighting rate.	Is accepted within the scientific community.
Statistical Reliability			- Approx. 40% of animals must be removed to yield a reliable index - Assumes pre- and post-removal counts are equally reliable - Assumes no mortality or immigration between pre- and post-removal counts - Harassment involved in removal may influence band and herd dynamics, affecting the visibility bias between the two counts - Precision of the estimate is dependant on both the proportion of animals removed (R/N) and the accuracy of the two counts	

	Ground Counts	Removal Method	Pre- and Post-Gather	Complete Count (Total Count)
Employee Safety	Low: To cover an area completely, many observers would be required. With access limited, most observers would have to be flown in aboard helicopters. Many landings in areas with no improved landing zones would require hazardous landing conditions.	Moderate: Risks would be similar to any gathering operation but more animals would have to be gathered than in a normal gathering operation.	Moderate: Does not include aviation hazards associated with marking animals but there are risks associated with gathering 40% of the population	High: This method would normally require use of fixed wing aircraft, which is generally safest.
Affect on Animals	Low: There would be very little affect as the observers would be concealed and in a non-threatening position some distance from the animals.	High: Because of the number of animals that would have to be gathered. Capturing efforts have a risk of death or injury to the animals.	High: Animals must endure three exposures to aircraft (pre- and post-removal census and removal). Increased risks to that portion of the population that may need to be released.	Low: The method would not involve chasing the animals or otherwise endangering them.
Relative Cost	Low: A lot of helicopter time would be required to place many observers in the field. Many work hours would be required to place enough observers in the field to view the HMAs.	Low: The amount of time and effort involved in capturing all the burros in an HMA would be very costly, due to the size of HMAs and the terrain.	Moderate: Pre- and post-removal census may be conducted using fixed-wing aircraft. Increases gather operation costs if some animals must be released (i.e., the 40% of the population gathered is greater than the number that must be removed to be at AML).	Low: Fixed wing flights are more cost effective than helicopter flights. However, it would require a very high number of hours of flight time to attempt to do a complete count. A past total count for the Havasu-AZ HMA in 6/77 used approx. 24 hrs of helicopter time and in 7/77 18.6 hrs of helicopter time was used to count the Havasu-CA HMA

	Ground Counts	Removal Method	Pre- and Post-Gather	Complete Count (Total Count)
Acceptance by Partners (including Az BLM, Az G&F Dept., other BLM offices, etc.	[To be determined after all relevant information is available]			
Remarks	This technique may be acceptable for observing small areas to determine the number of animals in a specific area such as the number using a water source or the number and identification of nuisance animals using private lands. Herd Areas that are to be observed in Az range from 40,000 acres to 1,100,000 acres in size with remote, rugged topography and very little access.	Under most circumstances this method would not be possible or practical due to the size, topography, and cover of the HMAs.		Although the method is accepted within the scientific community, it is not possible to count the total burro population due to HMA size, terrain, and cover. Sighting rates generally range form 45% to 70%. Complete counts with close to 100% accuracy are most likely only feasible in areas where the terrain is open and flat with burros in small bands that are not easily spooked by the aircraft.