

Appendix C

Win Equus Population Modeling Results

Population Model Overview

WinEquus is a program used to simulate the population dynamics and management of wild horses created by Stephen H. Jenkins of the Department of Biology, University of Nevada at Reno.

Detailed information is provided within the WinEquus program available at <http://unr.edu/homepage/jenkins>, and will provide background about the use of the model, the management options that may be used, and the types of output that may be generated.

The population model for wild horses was designed to help the BLM evaluate various management strategies that might be considered for a particular area. The model uses data on average survival probabilities and foaling rates of horses to project population growth for up to 20 years. The model accounts for year-to-year variation in these demographic parameters by using a randomization process to select survival probabilities and foaling rates for each age class from a distribution of values based on these averages. This aspect of population dynamics is called environmental stochasticity and reflects the fact that future environmental conditions that may affect wild horse population's demographics can't be established in advance. Therefore, each trial with the model will give a different pattern of population growth. Some trials may include mostly "good" years, when the population grows rapidly; other trials may include a series of several "bad" years in succession. The stochastic approach to population modeling uses repeated trials to project a range of possible population trajectories over a period of years, which is more realistic than predicting a single specific trajectory.

The model incorporates both selective removal and fertility treatment as management strategies. A simulation may include no management, selective removal, fertility treatment, or both removal and fertility treatment. Wild horse and burro specialists can specify many different options for these management strategies such as the schedule of gathers for removal or fertility treatment, the threshold population size which triggers a gather, the target population size following a removal, the ages and sexes of horses to be removed, and the effectiveness of fertility treatment.

To run the program, one must supply an initial age distribution (or have the program calculate one), annual survival probabilities for each age-sex class of horses, foaling rates for each age class of females, and the sex ratio at birth. Sample data are available for all of these parameters. Basic management options must also be specified.

Population Modeling – Adobe Town Salt Wells Creek, Great Divide Basin, White Mountain and Little Colorado HMAs

To complete the population modeling for the Adobe Town Salt Wells Creek, Great Divide Basin, White Mountain and Little Colorado HMAs, version 1.40 of the WinEquus program, created April 2, 2002, was utilized.

Objectives of Population Modeling

Review of the data output for each of the simulations provided many useful comparisons of the possible outcomes for each alternative. Some of the questions that need to be answered through the modeling include:

- Do any of the Alternatives “crash” the population?
- What effect does fertility control have on population growth rate?
- What effects do the different alternatives have on the average population size?
- What effects do the different alternatives have on the genetic health of the herd?

Population Data, Criteria, and Parameters utilized for Population Modeling

Initial age structure for the 2021 herd was developed from age structure data collected during the 2005 Adobe Town, Salt Wells Creek, and Great Divide Basin HMAs gathers. The following table shows the proposed age structure that was utilized in the population model for the Proposed Action and Alternatives:

Initial Age Structure

Age Class	Females	Males
Foal	106	115
1	32	28
2	92	66
3	26	30
4	16	27
5	16	6
6	8	24
7	23	22
8	20	26
9	15	15
10-14	16	26
15-19	5	25
20+	0	15
Total	375	425

All simulations used the survival probabilities, foaling rates, and sex ratio at birth that was supplied with the WinEquus population model for the Garfield HMA:

Sex ratio at Birth: 47% Females; 53% Males

The following percent effectiveness of fertility control was utilized in the population modeling for Alternative II:

Year 1: 82%, Year 2: 75% Year 3: 70%

The following percent effectiveness of fertility control was utilized in the population modeling for Alternative IV:

Year 1: 84%, Year 2: 77% Year 3: 72%

The following table displays the removal parameters utilized in the population model for Alternatives II-IV:

Removal Criteria

<i>Age</i>	<i>Percentages for Removals</i>	
	Females	Males
Foal	100%	100%
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	0%	0%
6	0%	0%
7	0%	0%
8	0%	0%
9	0%	0%
10-14	0%	0%
15-19	0%	0%
20+	0%	0%

The following table displays the contraception parameters utilized in the population model for Alternatives II and IV:

Contraception Criteria

Age	Percentages for Fertility Treatment
Foal	0%
1	100%
2	100%
3	100%
4	100%
5	100%
6	100%
7	100%
8	100%
9	100%
10-14	100%
15-19	100%
20+	100%

Population Modeling Criteria

The following summarizes the population modeling criteria that are common to all alternatives:

- Starting Year: 2021
- Initial gather year: 2021
- Gather interval: regular interval of Four years
- Gather for fertility treatment regardless of population size: No
- Continue to gather after reduction to treat females: Yes

- Sex ratio at birth: 53% males
- Percent of the population that can be gathered: 85% Alternatives II-IV for all HMAs except 95% for Little Colorado HMA.
- Minimum age for long-term holding facility horses: Not Applicable
- Foals are not included in the AML
- Simulations were run for 10 years with 100 trials each

The following table displays the population modeling parameters utilized in the model:

Population Modeling Parameters

Modeling Parameter	Alternative I No Action Alternative.	Alternative II (Proposed Action) Gather to the Low End of AML and Use Non-Permanent Fertility Control Treatments PZP and intrauterine devices (IUDs).	Alternative III Gather to the Low End of AML and Do Not Use Fertility Control Treatments.	Alternative IV Gather to the Low End of AML and remove excess wild horses, spay 100 mares, neuter 100 studs, and apply PZP or GonaCon to remaining released mares and implement sex ratio skewing 60% stallions and 40% mares.
Management by removal and fertility control	N/A	Yes	No	Yes
Management by removal only	N/A	No	Yes	No
Threshold Population Size for Gathers	N/A	365 Salt Wells Creek HMA 800 Adobe Town HMA 600 Great Divide Basin HMA 300 White Mountain HMA 100 Little Colorado HMA	365 Salt Wells Creek HMA 800 Adobe Town HMA 600 Great Divide Basin HMA 300 White Mountain HMA 100 Little Colorado HMA	365 Salt Wells Creek HMA 800 Adobe Town HMA 600 Great Divide Basin HMA 300 White Mountain HMA 100 Little Colorado HMA
Target Population Size Following Gathers	N/A	251 Salt Wells Creek HMA 610 Adobe Town HMA 415 Great Divide Basin HMA 205 White Mountain HMA 69 Little Colorado HMA	251 Salt Wells Creek HMA 610 Adobe Town HMA 415 Great Divide Basin HMA 205 White Mountain HMA 69 Little Colorado HMA	251 Salt Wells Creek HMA 610 Adobe Town HMA 415 Great Divide Basin HMA 205 White Mountain HMA 69 Little Colorado HMA
Gather for fertility control regardless of population size	N/A	No	No	No
Gathers continue after removals to treat additional females	N/A	Yes	No	Yes
Effectiveness of Fertility Control: year 1	N/A	82%	N/A	84%
Effectiveness of Fertility Control: year 2	N/A	75%	N/A	77%
Effectiveness of Fertility Control: year 3	N/A	70%	N/A	72%

Results of WinEquus Population Modeling

Interpretation of the Model

The estimated population of 1,338 wild horses in the Adobe Town HMA, 1,073 wild horses in the Salt Wells Creek HMA, 1,539 wild horses in the Great Divide Basin HMA, 563 wild horses in the White Mountain HMA and 592 wild horses in the Little Colorado HMA was based on a March 2019 population survey and was used in the population modeling. Year one is the baseline starting point for the model that reflects wild horse numbers immediately prior to the gather action and reflects a slightly skewed sex ratio which favors males. A sex ratio of 53:47 was entered into the model for the post gather action population. In this population modeling, year one would be 2021. Year two would be exactly one year in time from the original action, and so forth for years three, four, and five, etc. Consequently, at year eleven in the model, exactly ten years in time would have passed. In this model, year eleven is 2031. This is reflected in the Population Size Modeling Table by “Population sizes in ten years” and in the Growth Rate Modeling Table by “Average growth rate in 10 years.” Growth rate is averaged over ten years in time, while the population is predicted out the same ten years to the end point of year eleven. The Full Modeling Summaries contain tables and graphs directly from the modeling program.

The initial herd size, sex ratio and age distribution for 2021 was structured by the WinEquus Population Model using data from the horses gathered and removed during the 2005 gather. This initial population data was then entered into the model and the model was used to predict various outcomes of the different alternatives, including the No Action Alternative for comparison purposes.

The parameters for the population modeling were:

1. Gather when population exceeds 810 wild horses in the Adobe Town HMA, 365 wild horses in the Salt Wells Creek HMA 415 wild horses in the Great Divide Basin HMA, 205 wild horses in the White Mountain HMA and 69 in the Little Colorado HMA.
2. Foals are not included in AML.
3. Percent to gather 85% in all HMAs and 95% in the Little Colorado HMA for Alternatives II-IV.
4. Four years between gathers
5. Number of trials 100
6. Number of years 10
7. Initial calendar year 2020
8. Initial population size: 1,338 wild horses in the Adobe Town HMA, 1,073 wild horses in the Salt Wells Creek HMA, 1,539 wild horses in the Great Divide Basin HMA, 563 wild horses in the White Mountain HMA and 592 wild horses in the Little Colorado HMA.
9. Population size after gather would be 610 wild horses in the Adobe Town HMA, 251 wild horses in the Salt Wells Creek HMA, 415 wild horses in the Great Divide Basin HMA, 205 wild horses in the White Mountain HMA and 69 wild horses in the Little Colorado HMA.
10. Implement selective removal criteria.
11. Fertility control Yes for Alternatives II and IV and No for Alternative I and III.

Results: ADOBE TOWN HMA

Alternative I: – No Action Alternative – No Gather or Removal in the Adobe Town HMA.

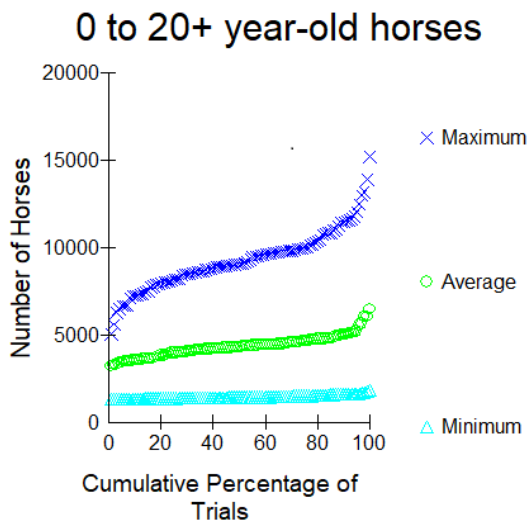
The parameters for the population modeling were:

Do not gather in 2021

Foals are not included in AML

Percent to gather 0

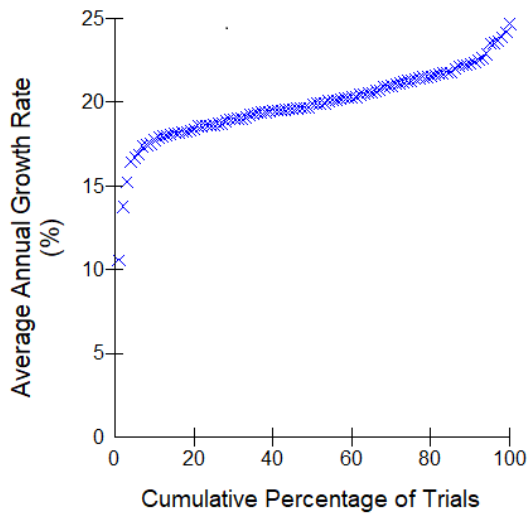
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	1345	3263	5093
10 th Percentile	1385	3620	7311
25 th Percentile	1408	4014	8230
Median Trial	1462	4362	3924
75 th Percentile	1552	4704	10064
90 th Percentile	1646	5060	11558
Highest Trial	1863	6516	15247

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

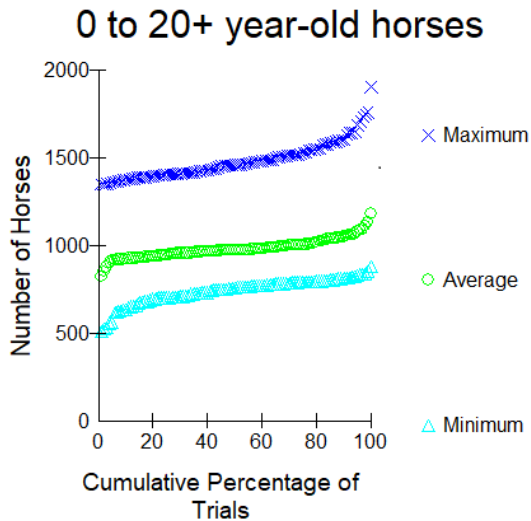


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	10.6%
10 th Percentile	17.8%
25 th Percentile	18.7%
Median Trial	19.9%
75 th Percentile	21.4%
90 th Percentile	22.4%
Highest Trial	24.7%

Alternative II: – Removal of Excess Animals to the Lower Limit of AML range (610) with Fertility Control in Adobe Town HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

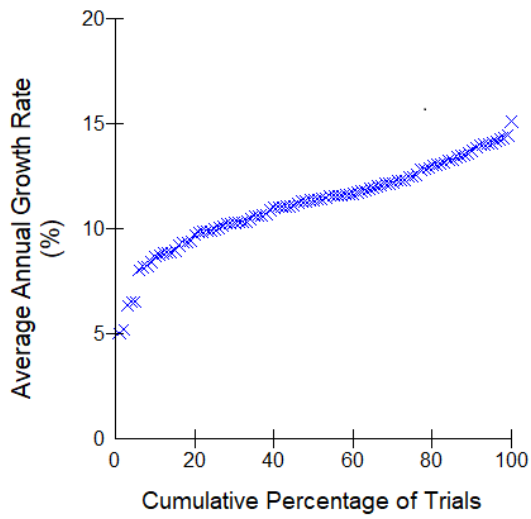
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	515	826	1354
10 th Percentile	644	928	1384
25 th Percentile	707	950	1412
Median Trial	764	977	1468
75 th Percentile	797	1008	1536
90 th Percentile	819	1056	1622
Highest Trial	883	1183	1909

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

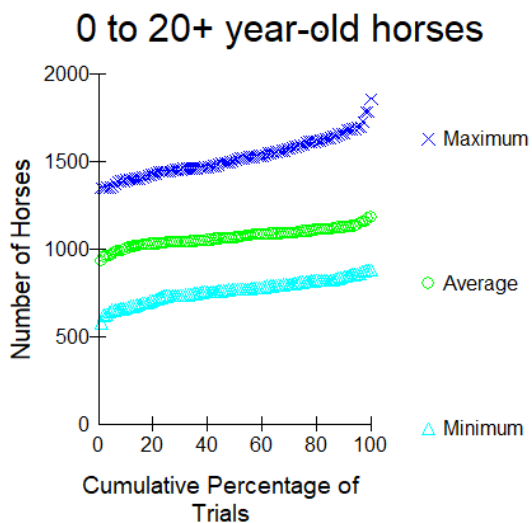


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	5.0%
10 th Percentile	8.7%
25 th Percentile	10.0%
Median Trial	11.4%
75 th Percentile	12.5%
90 th Percentile	13.8%
Highest Trial	15.1%

Alternative III: – Removal of Excess Animals to the Lower Limit of AML range (610) with No Fertility Control in Adobe Town HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, No, do not treat all mares released with fertility control.

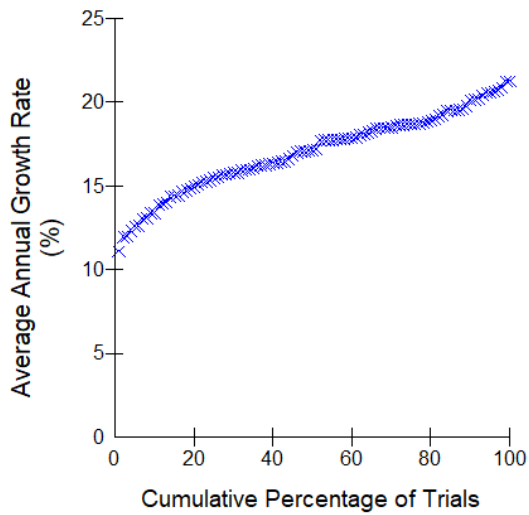
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	582	934	1353
10 th Percentile	670	1007	1402
25 th Percentile	736	1039	1450
Median Trial	772	1068	1519
75 th Percentile	816	1104	1610
90 th Percentile	845	1127	1678
Highest Trial	882	1185	1861

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	11.1%
10 th Percentile	13.6%
25 th Percentile	15.5%
Median Trial	17.2%
75 th Percentile	18.7%
90 th Percentile	20.1%
Highest Trial	21.2%

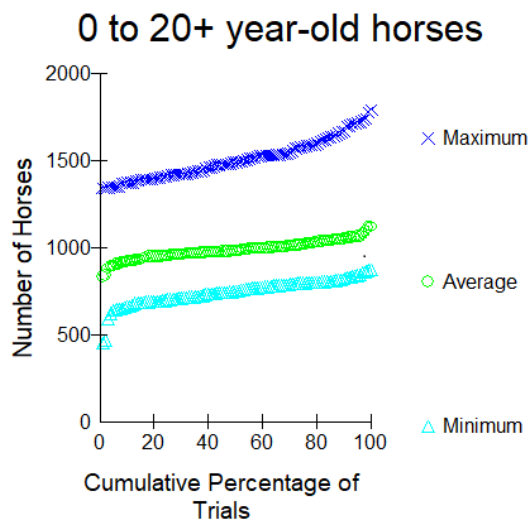
Alternative IV: – Removal of Excess Animals to the Lower Limit of AML range (610) with Fertility Control and spaying 41 mares in Adobe Town HMA.

The parameters for the population modeling were:

1-10, The same as parameters listed above.

11, Yes, treat all mares released with fertility control.

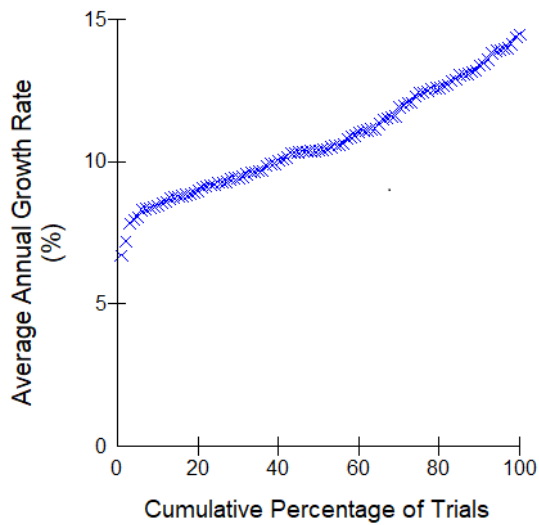
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	457	837	1346
10 th Percentile	667	926	1380
25 th Percentile	706	958	1421
Median Trial	753	986	1496
75 th Percentile	800	1024	1587
90 th Percentile	830	1054	1689
Highest Trial	876	1122	1796

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	6.7%
10 th Percentile	8.5%
25 th Percentile	9.3%
Median Trial	10.4%
75 th Percentile	12.4%
90 th Percentile	13.4%
Highest Trial	14.5%

Results: Salt Wells Creek HMA

Alternative I: – No Action Alternative – No Gather or Removal in the Salt Wells Creek HMA.

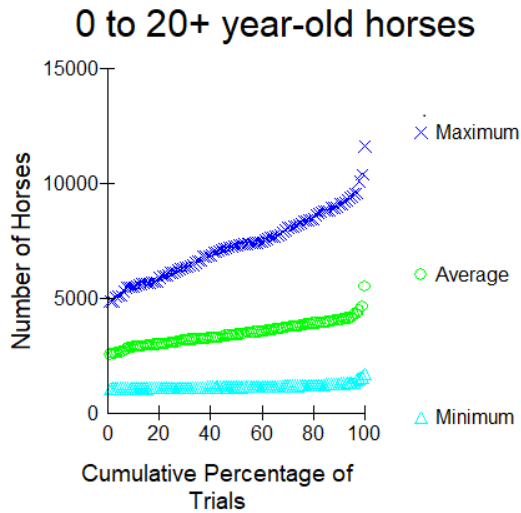
The parameters for the population modeling were:

Do not gather in 2021

Foals are not included in AML

Percent to gather 0

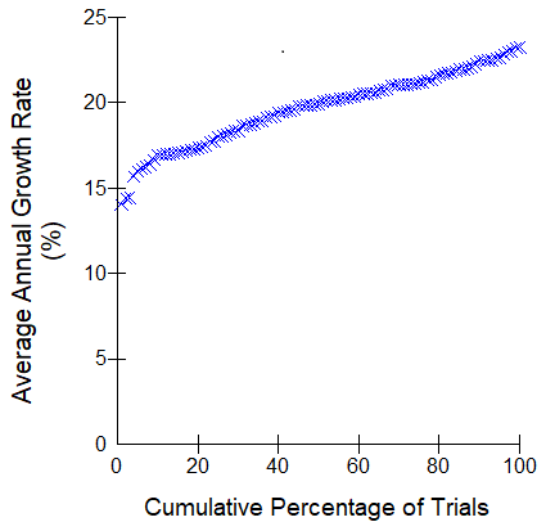
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	1078	2573	4902
10 th Percentile	1113	2902	5574
25 th Percentile	1127	3089	6176
Median Trial	1166	3440	7352
75 th Percentile	1225	3832	8364
90 th Percentile	1310	4087	9152
Highest Trial	1729	5531	11657

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table

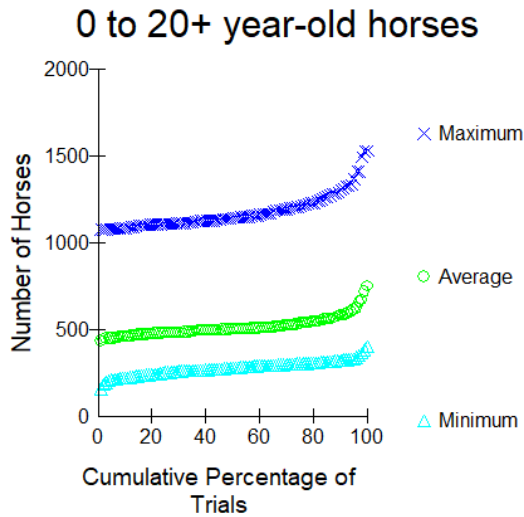


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	14.0%
10 th Percentile	17.0%
25 th Percentile	18.0%
Median Trial	20.0%
75 th Percentile	21.2%
90 th Percentile	22.5%
Highest Trial	23.3%

Alternative II: – Removal of Excess Animals to the Lower Limit of AML range (251) with Fertility Control in Salt Wells Creek HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

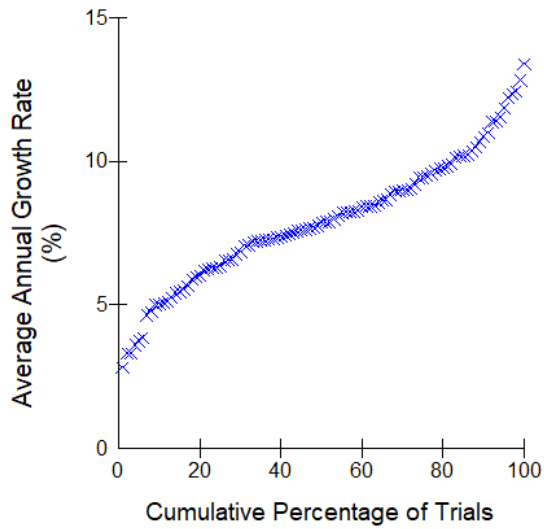
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	162	438	1083
10 th Percentile	225	464	1092
25 th Percentile	256	484	1114
Median Trial	282	505	1152
75 th Percentile	306	539	1218
90 th Percentile	326	584	1314
Highest Trial	404	754	1537

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

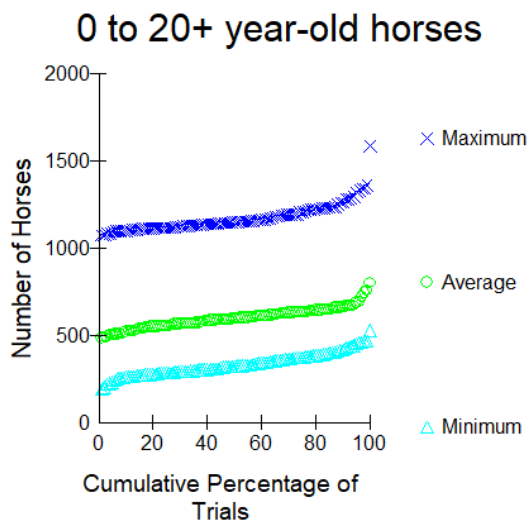


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	2.8%
10 th Percentile	5.1%
25 th Percentile	6.5%
Median Trial	7.9%
75 th Percentile	9.5%
90 th Percentile	10.9%
Highest Trial	13.4%

Alternative III: – Removal of Excess Animals to the Lower Limit of AML range (251) with No Fertility Control in Salt Wells Creek HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, No, do not treat all mares released with fertility control.

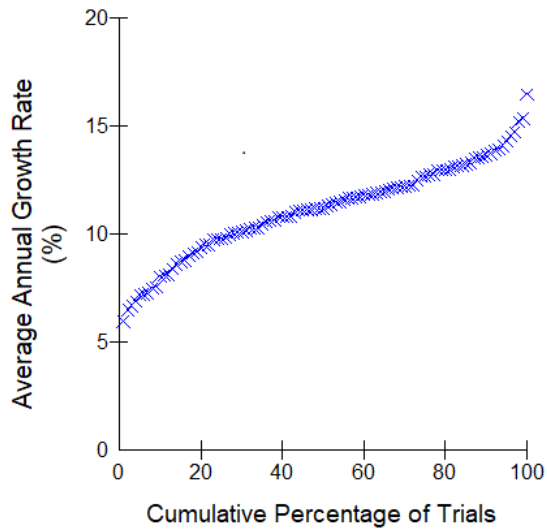
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	196	488	1078
10 th Percentile	266	526	1108
25 th Percentile	290	560	1124
Median Trial	327	599	1155
75 th Percentile	376	639	1214
90 th Percentile	424	668	1276
Highest Trial	530	805	1591

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

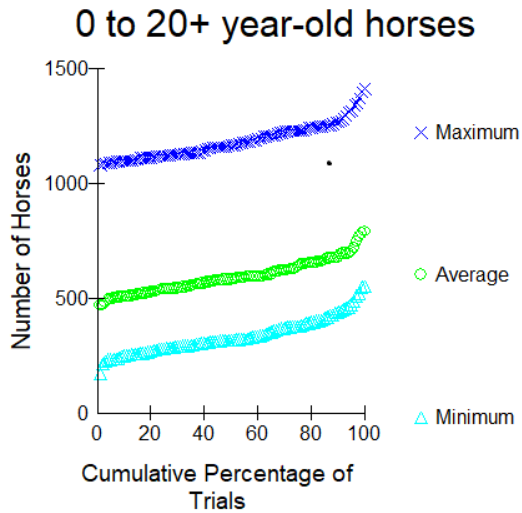


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	6.0%
10 th Percentile	8.1%
25 th Percentile	9.8%
Median Trial	11.3%
75 th Percentile	12.7%
90 th Percentile	13.7%
Highest Trial	16.5%

Alternative IV: – Removal of Excess Animals to the Lower Limit of AML range (251) with Fertility Control and spaying 9 mares in Salt Wells Creek HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

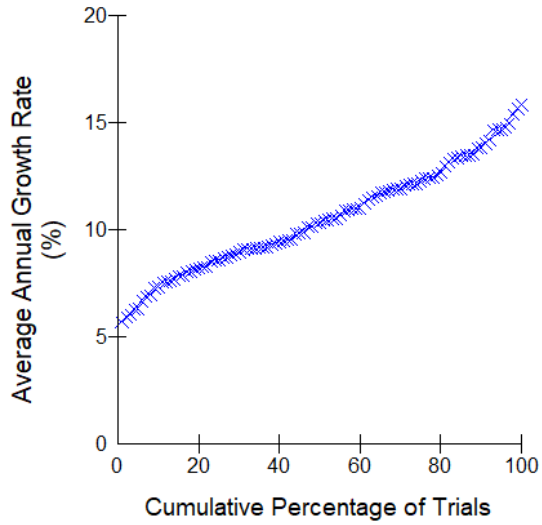
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	174	471	1083
10 th Percentile	254	511	1104
25 th Percentile	284	541	1126
Median Trial	320	585	1170
75 th Percentile	381	644	1234
90 th Percentile	444	688	1274
Highest Trial	553	792	1416

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	5.7%
10 th Percentile	7.4%
25 th Percentile	8.6%
Median Trial	10.4%
75 th Percentile	12.3%
90 th Percentile	13.9%
Highest Trial	15.8%

Results: Great Divide Basin HMA

Alternative I: – No Action Alternative – No Gather or Removal in the Great Divide Basin HMA.

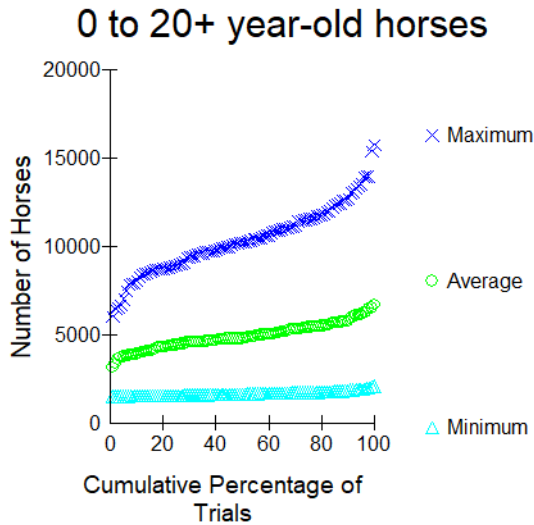
The parameters for the population modeling were:

Do not gather in 2021

Foals are not included in AML

Percent to gather 0

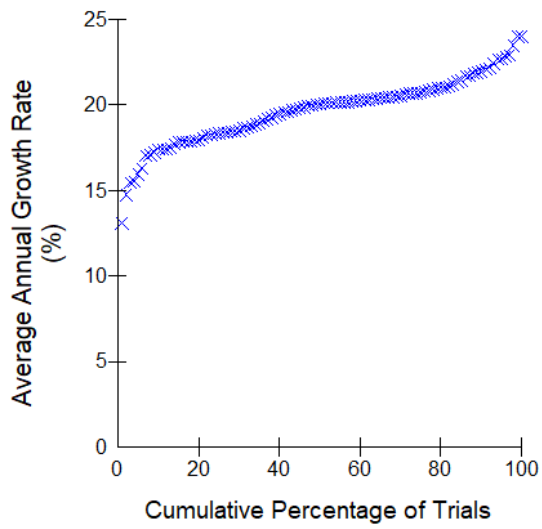
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	1539	3164	6076
10 th Percentile	1568	3954	8207
25 th Percentile	1605	4456	9008
Median Trial	1672	4831	10274
75 th Percentile	1763	5464	11628
90 th Percentile	1896	5874	12912
Highest Trial	2135	6725	15783

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table

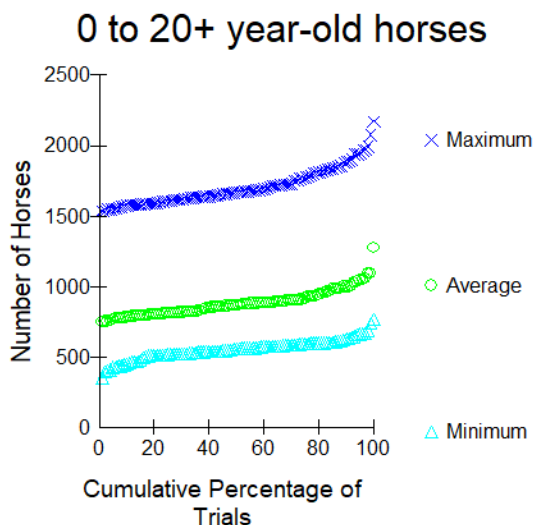


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	13.1%
10 th Percentile	17.4%
25 th Percentile	18.4%
Median Trial	20.1%
75 th Percentile	22.0%
90 th Percentile	20.0%
Highest Trial	24.0%

Alternative II: – Removal of Excess Animals to the Lower Limit of AML range (415) with Fertility Control in Great Divide Basin HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

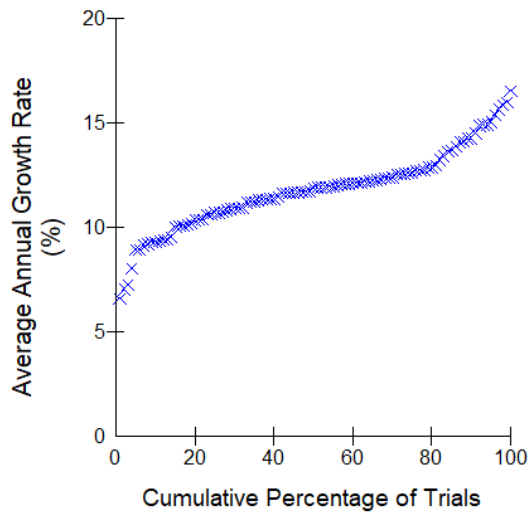
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	350	751	1541
10 th Percentile	456	784	1580
25 th Percentile	520	812	1610
Median Trial	560	868	1674
75 th Percentile	596	923	1782
90 th Percentile	636	1000	1890
Highest Trial	768	1277	2175

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

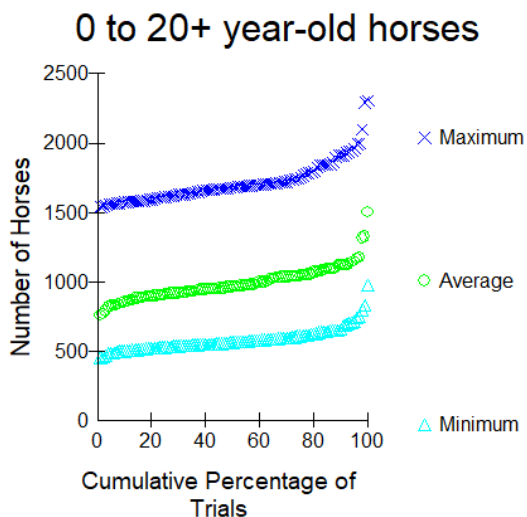


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	6.6%
10 th Percentile	9.3%
25 th Percentile	10.7%
Median Trial	11.9%
75 th Percentile	12.7%
90 th Percentile	14.4%
Highest Trial	16.5%

Alternative III: – Removal of Excess Animals to the Lower Limit of AML range (415) with No Fertility Control in the Great Divide Basin HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, No, do not treat all mares released with fertility control.

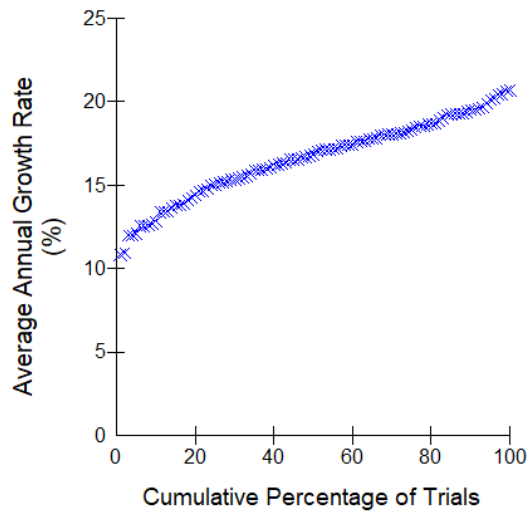
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	456	762	1545
10 th Percentile	504	857	1580
25 th Percentile	530	912	1617
Median Trial	568	966	1684
75 th Percentile	612	1047	1761
90 th Percentile	671	1121	1916
Highest Trial	977	1503	2311

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table

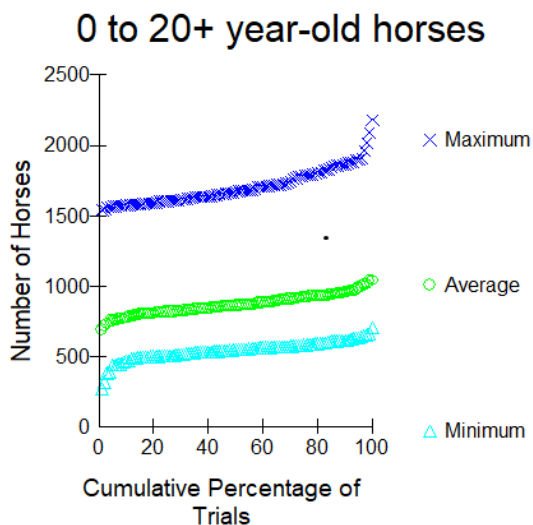


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	10.8%
10 th Percentile	13.1%
25 th Percentile	15.1%
Median Trial	17.0%
75 th Percentile	18.4%
90 th Percentile	19.5%
Highest Trial	20.7%

Alternative IV: – Removal of Excess Animals to the Lower Limit of AML range (415) with Fertility Control and spaying 18 mares in the Great Divide Basin HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

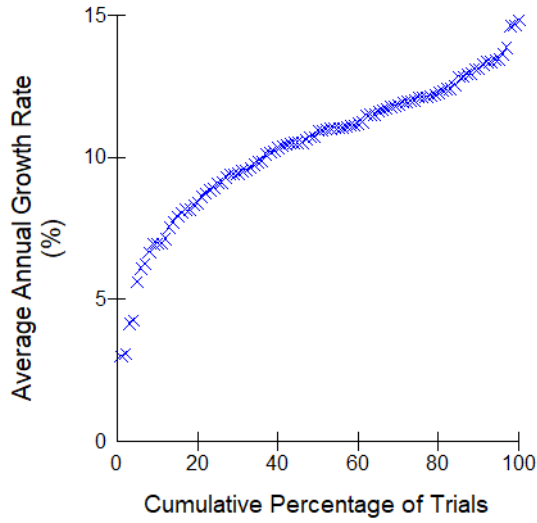
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	272	691	1542
10 th Percentile	470	781	1580
25 th Percentile	507	819	1609
Median Trial	550	863	1677
75 th Percentile	584	923	1792
90 th Percentile	614	958	1873
Highest Trial	707	1041	2182

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	3.0%
10 th Percentile	7.0%
25 th Percentile	9.1%
Median Trial	10.9%
75 th Percentile	12.1%
90 th Percentile	13.2%
Highest Trial	14.8%

Results: WHITE MOUNTAIN HMA

Alternative I: – No Action Alternative – No Gather or Removal in the White Mountain HMA.

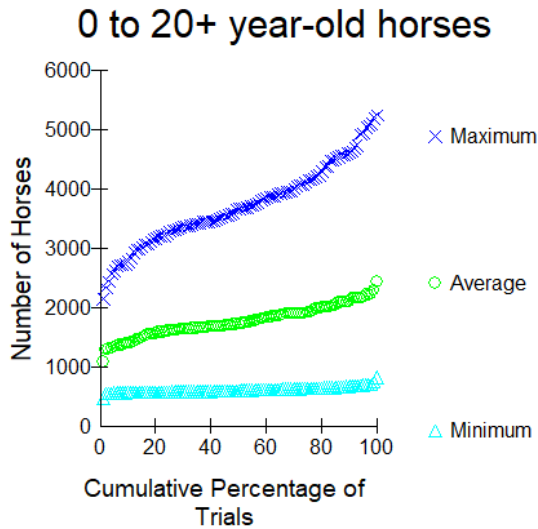
The parameters for the population modeling were:

Do not gather in 2021

Foals are not included in AML

Percent to gather 0

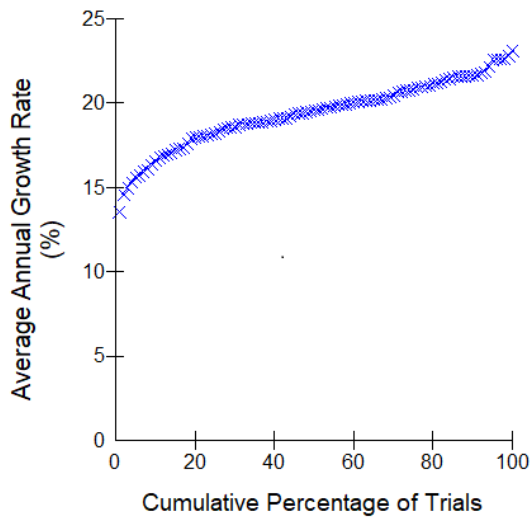
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	480	1095	2162
10 th Percentile	576	1417	2820
25 th Percentile	590	1620	3312
Median Trial	610	1740	3682
75 th Percentile	648	1934	4173
90 th Percentile	687	2136	4642
Highest Trial	835	2441	5264

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table

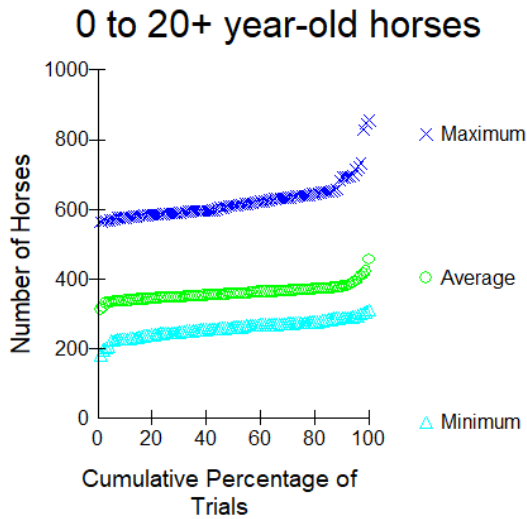


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	13.5%
10 th Percentile	16.7%
25 th Percentile	18.3%
Median Trial	19.6%
75 th Percentile	20.9%
90 th Percentile	21.7%
Highest Trial	23.1%

Alternative II: – Removal of Excess Animals to the Lower Limit of AML range (205) with Fertility Control in White Mountain HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

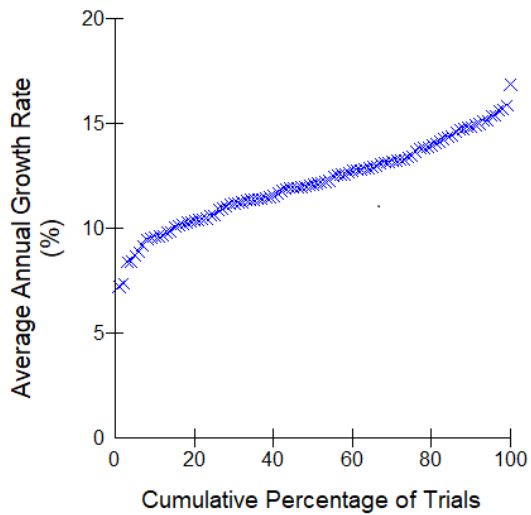
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	182	313	565
10 th Percentile	229	338	579
25 th Percentile	246	346	589
Median Trial	262	358	612
75 th Percentile	275	369	641
90 th Percentile	289	379	694
Highest Trial	311	455	857

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

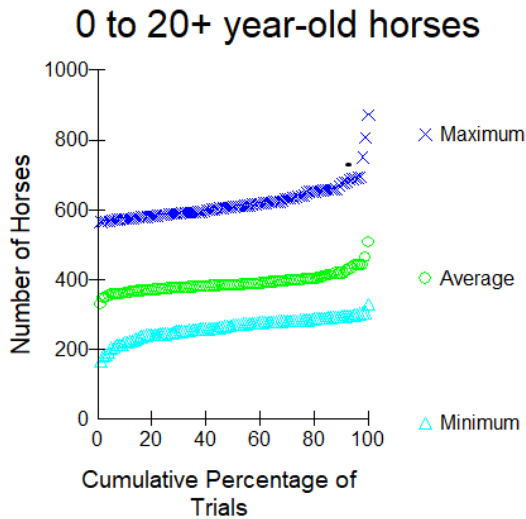


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	7.2%
10 th Percentile	9.6%
25 th Percentile	10.8%
Median Trial	12.1%
75 th Percentile	13.6%
90 th Percentile	14.9%
Highest Trial	16.9%

Alternative III: – Removal of Excess Animals to the Lower Limit of AML range (205) with No Fertility Control in White Mountain HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, No, do not treat all mares released with fertility control.

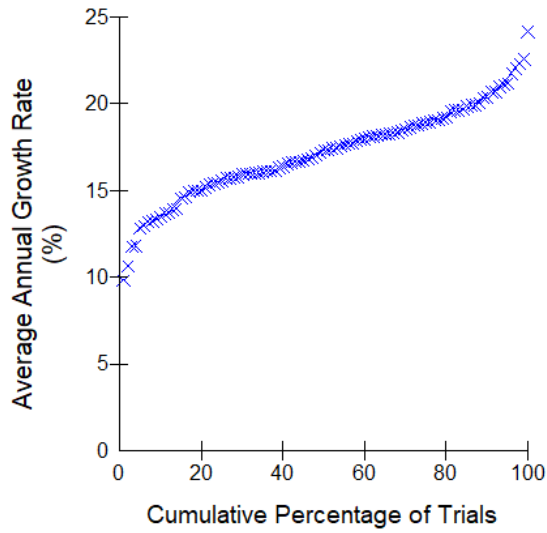
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	166	329	566
10 th Percentile	220	362	576
25 th Percentile	244	374	588
Median Trial	271	384	610
75 th Percentile	284	400	641
90 th Percentile	295	418	678
Highest Trial	330	508	872

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	9.8%
10 th Percentile	13.6%
25 th Percentile	15.6%
Median Trial	17.3%
75 th Percentile	18.9%
90 th Percentile	20.5%
Highest Trial	24.2%

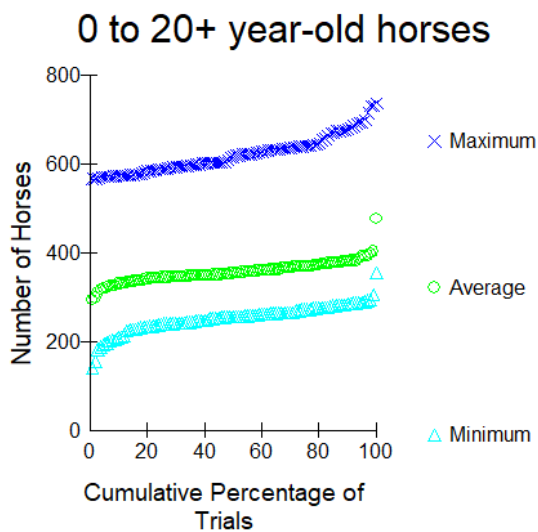
Alternative IV: – Removal of Excess Animals to the Lower Limit of AML range (205) with Fertility Control and spaying 12 mares in the White Mountain HMA.

The parameters for the population modeling were:

1-10, The same as parameters listed above.

11, Yes, treat all mares released with fertility control.

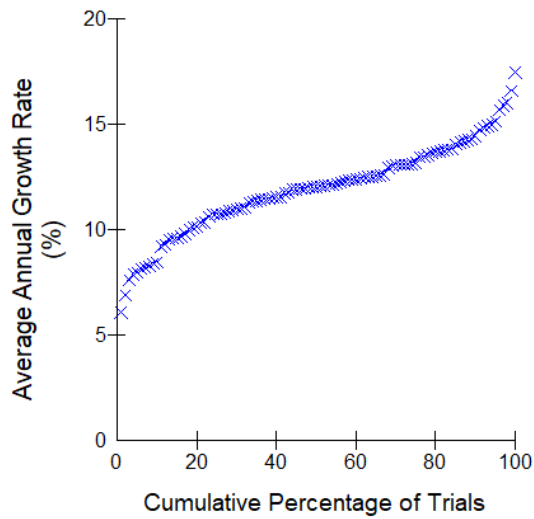
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	142	295	569
10 th Percentile	210	331	576
25 th Percentile	240	346	590
Median Trial	258	355	620
75 th Percentile	274	371	643
90 th Percentile	287	383	682
Highest Trial	356	479	738

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	6.1%
10 th Percentile	8.8%
25 th Percentile	10.7%
Median Trial	12.1%
75 th Percentile	13.3%
90 th Percentile	14.6%
Highest Trial	17.5%

Results: LITTLE COLORADO HMA

Alternative I: – No Action Alternative – No Gather or Removal in the Little Colorado HMA.

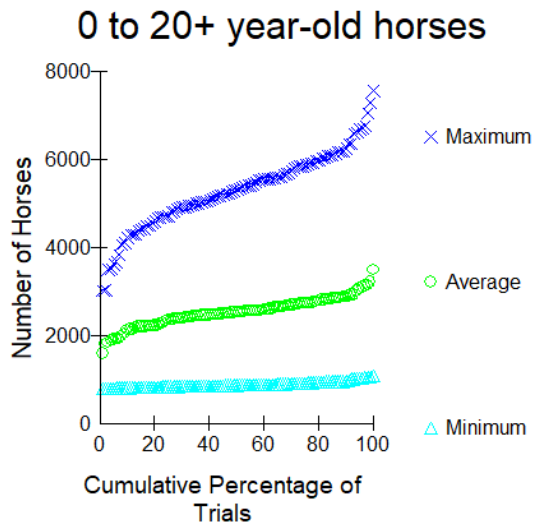
The parameters for the population modeling were:

Do not gather in 2021

Foals are not included in AML

Percent to gather 0

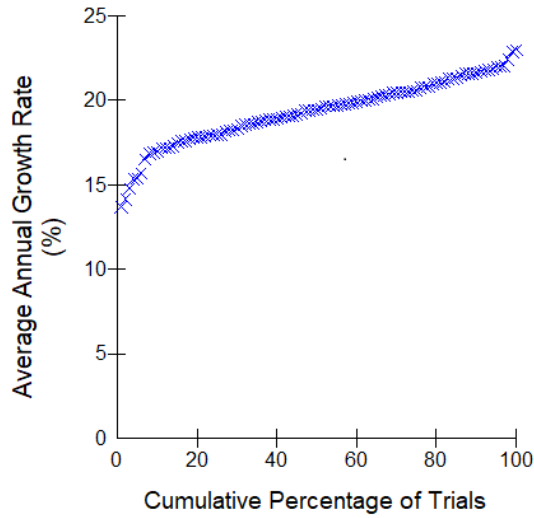
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	806	1607	3035
10 th Percentile	824	2148	4276
25 th Percentile	848	2373	4779
Median Trial	882	2548	5342
75 th Percentile	935	2751	5904
90 th Percentile	976	2904	6321
Highest Trial	1093	3501	7578

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table

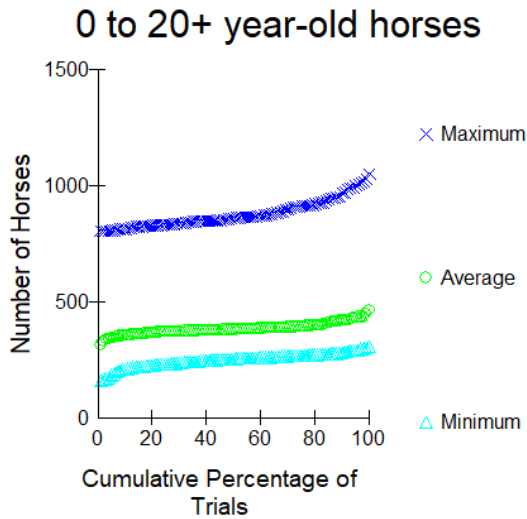


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	13.7%
10 th Percentile	17.1%
25 th Percentile	18.0%
Median Trial	19.5%
75 th Percentile	20.7%
90 th Percentile	21.7%
Highest Trial	23.0%

Alternative II: – Removal of Excess Animals to the Lower Limit of AML range (69) with Fertility Control in the Little Colorado HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, Yes, treat all mares released with fertility control.

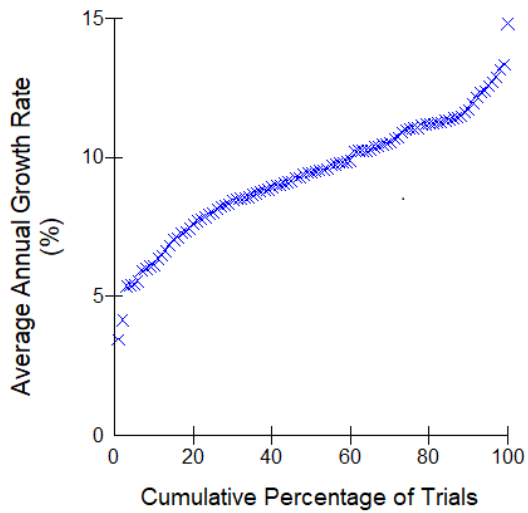
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	161	318	807
10 th Percentile	214	358	818
25 th Percentile	234	373	836
Median Trial	256	383	864
75 th Percentile	272	396	917
90 th Percentile	285	425	974
Highest Trial	308	466	1055

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)

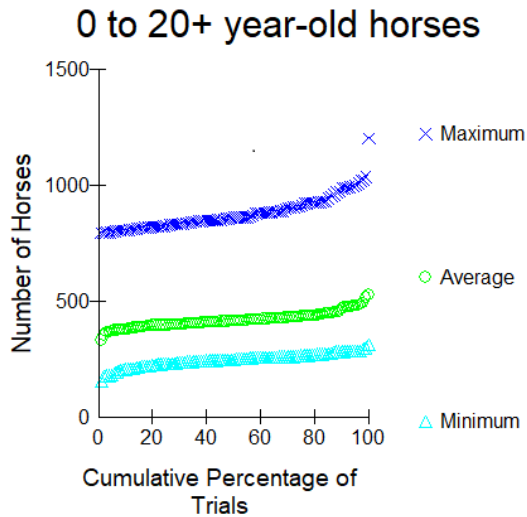


AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	3.5%
10 th Percentile	6.2%
25 th Percentile	8.1%
Median Trial	9.5%
75 th Percentile	11.0%
90 th Percentile	11.8%
Highest Trial	14.9%

Alternative III: – Removal of Excess Animals to the Lower Limit of AML range (69) with No Fertility Control in the Little Colorado HMA.

The parameters for the population modeling were:
 1-10, The same as parameters listed above.
 11, No, do not treat all mares released with fertility control.

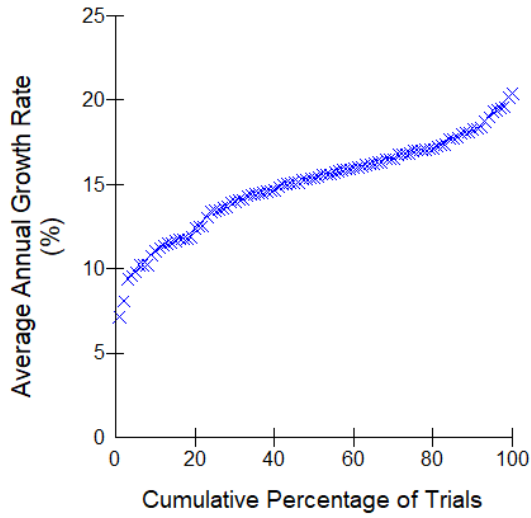
Population Size and Modeling Graph and Table



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	157	333	800
10 th Percentile	210	382	811
25 th Percentile	233	399	832
Median Trial	252	418	865
75 th Percentile	267	438	922
90 th Percentile	285	473	992
Highest Trial	313	529	1207

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	7.1%
10 th Percentile	11.2%
25 th Percentile	13.5%
Median Trial	15.4%
75 th Percentile	17.0%
90 th Percentile	18.3%
Highest Trial	20.4%

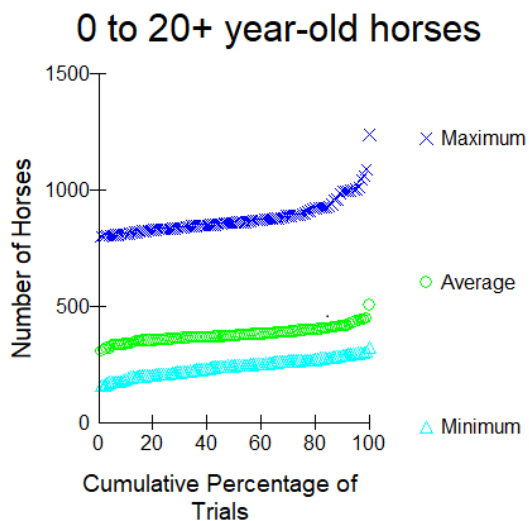
Alternative IV: – Removal of Excess Animals to the Lower Limit of AML range (69) with Fertility Control and spaying 4 mares in the Little Colorado HMA.

The parameters for the population modeling were:

1-10, The same as parameters listed above.

11, Yes, treat all mares released with fertility control.

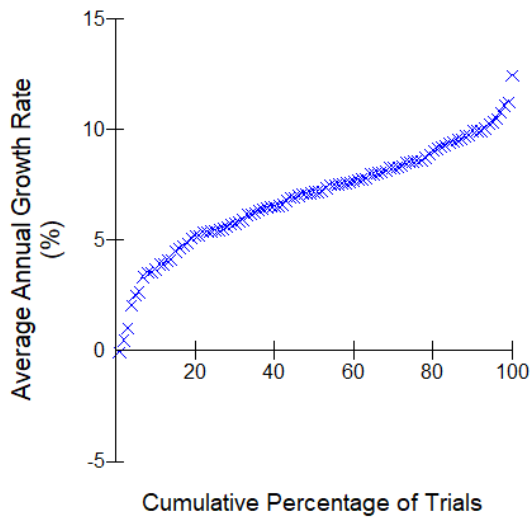
Population Size and Modeling Graph and Table (Gather and Fertility Control)



POPULATION SIZES IN 11 YEARS*			
	MINIMUM	AVERAGE	MAXIMUM
Lowest Trial	161	311	802
10 th Percentile	193	340	816
25 th Percentile	213	361	838
Median Trial	248	376	864
75 th Percentile	270	399	902
90 th Percentile	292	419	999
Highest Trial	325	507	1241

* 0 to 20+ year-old horses

Growth Rate Modeling Graph and Table (Gather and Fertility Control)



AVERAGE GROWTH RATE IN 10 YEARS	
Lowest Trial	0.0%
10 th Percentile	3.8%
25 th Percentile	5.5%
Median Trial	7.2%
75 th Percentile	8.6%
90 th Percentile	9.9%
Highest Trial	12.4%