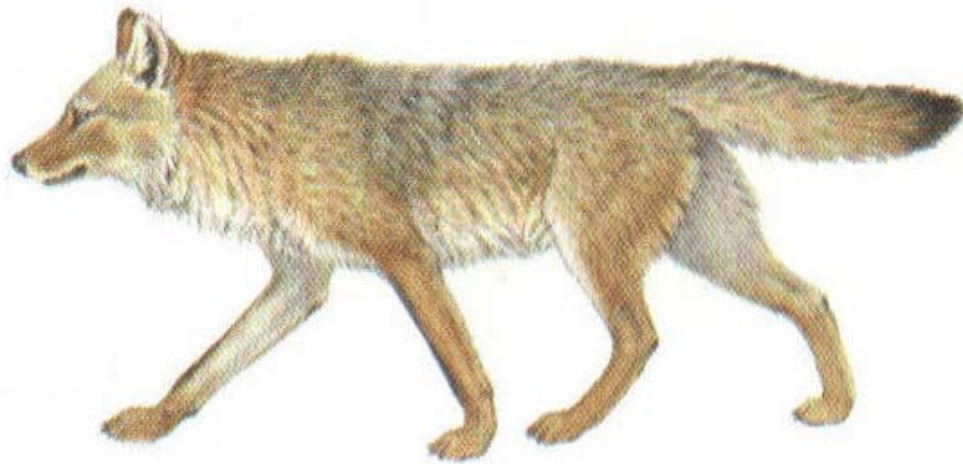


Population Analysis And Breeding/Transfer Plan

Red Wolf

Canis rufus gregoryi

Species Survival Plan[®]



Species Coordinator

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2 October 2001

This report prepared with assistance from the
American Zoo and Aquarium Association Population Management Center In Chicago



Executive Summary

Breeding/Transfer Plan - Red Wolf SSP[®]

The captive population of red wolves consists of 156 (76.80) animals at 32 participating institutions as of July 2001. The population has been growing steadily in captivity since the early 1970s, with a slight decline in numbers in recent years. The target population size set by the SSP and the Canid Taxon Advisory Group is 250.

Current gene diversity for the managed population is 90.39% with 8.25 founder genomes surviving, which represents the descendants of 12 founders. When gene diversity falls below 90%, it is expected that reproduction will be increasingly compromised by, among other factors, lower birth weights, smaller litter sizes, and greater neonatal mortality. To maintain gene diversity at or above 90% for a few more years, without importation of additional founders, the population needs to increase in size and/or increase the proportion of breeders in the population. More realistically, gene diversity can be maintained at or above 85% for 16 years at the current population size and with a growth rate of 4%, or for 23 years with a maximum population size of 250.

DEMOGRAPHY

	<i>Current</i>	<i>Target</i>
Current Population Size	156 (79.77)	250
Specimens Excluded from Genetic Analyses	12 (7.5)	
Number of Participating Institutions	32	
Mean Generation Time (years)	5.81	
Potential Population Growth Rate	1.04	
Number of Transfers Within The SSP (Breeding/Space) to be determined		
Number of Specimens to Import/Export	0	

GENETICS

	<i>Current</i>	<i>Potential</i>
Number of Founders	12	0
Founder Genome Equivalents	5.2	8.25
Current Gene Diversity (% of Wild)	90.4	94.0
Mean Inbreeding Coefficient	0.055	
Years To 90% Gene Diversity	0	
Gene Diversity at 100 Years From Present (%)	63.55	

For the 2002 breeding season, 33 breeding recommendations have been made, all of which will maintain or increase gene diversity if they are successful. Pairings are based on mean kinship, avoidance of inbreeding, avoidance of linking rare and common lineages, and logistical constraints identified by the participating institutions. Although inbreeding should be avoided in order to maintain a healthy captive population, it has become increasingly difficult to avoid in this population in the absence of additional founders. Higher levels of inbreeding will need to be tolerated and long term genetic goals will need to be set at lower than 90% gene diversity. The SSP should continue to monitor the population and consider, from a health standpoint, the level of inbreeding that is tolerable in this species.

The SSP also recommends reproductive evaluations, in the form of year round fecal sampling, of all females that may be considered for breeding this season or in the near future. Further instructions and protocol will be provided by contacting Karen Goodrowe, Reproductive Physiologist, Toronto Zoo (416-392-5980 or kgoodrowe@zoo.metrotor.on.ca).

Summary Actions 2001-2002: The SSP will have 33 breeding pairs and no exports or imports for the 2002 breeding season.

Acknowledgements

The Red Wolf SSP master planning meeting was hosted by the Henson Robinson Zoo in Springfield, Illinois on 13-14 July 2001 and was attended by the following:

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**This plan was prepared and distributed with the assistance of the AZA
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pmc@brookfieldzoo.org

Table of Contents

Executive Summary	1
Acknowledgements	3
Description of Population Status	
Introduction	4
Demography	4
Genetics	5
Management Strategy	5
Recommendations	
Summary Recommendations	6
Alexandria Zoological Park	10
North Carolina Zoological Park	10
Western NC Nature Center	11
Cape Romain Nat'l Wildlife Refuge	11
Ross Park Zoo	12
Miller Park Zoo	12
Brevard Zoo	13
Beardsley Zoological Gardens	13
Wildlife Science Center (Carlos Avery)	14
Tennessee Wildlife Center	14
N C Museum of Life and Science	15
Fort Worth Zoo	15
Fossil Rim Wildlife Center	16
Chaffee Zool Gardens of Fresno	16
Land Between the Lakes	17
NEW Zoo	17
Jacksonville Zoological Gardens	18
Knoxville Zoological Gardens	18
Lowry Park Zoological Garden	19
Alligator River Nat'l Wldlf Refuge	20
Mill Mountain Zoo	20
North Carolina State University-USFWS	21
Roger Williams Park Zoo	21
Racine Zoological Garden	22
Great Plains Zoo	22
Henson Robinson Zoo	23
Burnet Park Zoo (Rosamond Gifford Zoo)	23
Point Defiance Zoo & Aquarium	24
Tallahassee Mus.History & Natural Sc	26
Trevor Zoo	26
Texas Zoo	27
Wild Canid Survival & Res Center	27
Oglebay's Good Children's Zoo	28
Appendix A Summary of Data Used to Prepare Breeding & Transfer Plan	29
Appendix B List of Individuals Excluded from the Genetic Analyses	29
Appendix C Life Tables	30
Appendix D Ordered Mean Kinship List	31
Appendix E Definitions	33

Description of Population Status

Red Wolf SSP®

Introduction: Red wolves have been maintained in captivity since the early 1970's, when the U.S. Fish and Wildlife Service began capturing individuals from the remaining wild population in Texas and Louisiana. At that time, a captive breeding program was established to increase the population size of red wolves and reestablish this federally endangered species in portions of its original range. The captive population increased steadily from the late 1970's to the mid 1990's, when the population size peaked and began to decline slightly. The captive population has been managed demographically and genetically with the cooperation of approved zoos and nature centers across the country. The demographic and genetic analyses upon which this report is based were performed in July 2001 using SPARKS v1.42 and PM2000 v1.12 software and data obtained from the red wolf studbook, current to June 4 2001. Based on these analyses, breeding plans were made at the Red Wolf SSP Master Plan Meeting at Henson Robinson Zoo, Springfield, Illinois on July 13-14, 2001.

Analytical Population: As of June 2001, the size of the captive red wolf population in North America was 156 (76.80.0) distributed among 32 institutions. Of these 156 animals, 12 (4.8.0) were excluded from the genetic analyses due to sterility, age, or health concerns (Appendix A), resulting in a population size of 144 for the analyses.

Demography: The Canid, Hyenid, and Aardwolf TAG has set a target population size for this species at 250. Demographic projections show that with an average annual growth rate of 4-5%, this population would grow to 250 specimens in approximately 13 years.

The age structure of this population shows a large proportion of animals in the older age classes (Figure 1). The large number of animals at or approaching reproductive senescence is a concern for this population. Demographic data indicate that female red wolves have not demonstrated the ability to reproduce beyond the age of 11 in captivity, and males not past 17 (Figure 2, Appendix B). An increase in births is crucial to maintaining or increasing the population size, replacing the animals that will be lost due to natural attrition, and providing a reproductive base for the future.

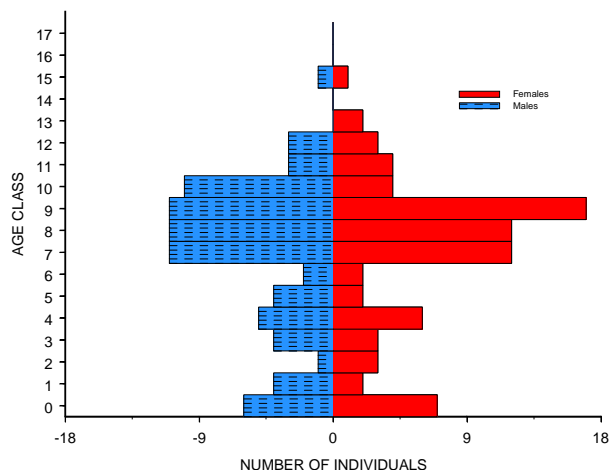


Figure 1. Age distribution of captive North American red wolf population as of June 2001 (N = 156).

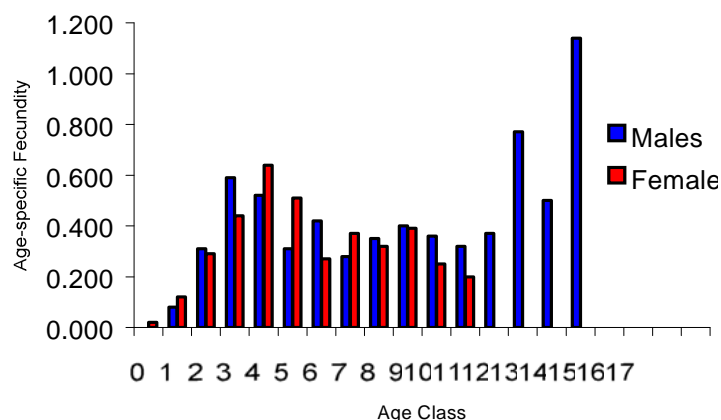


Figure 2. Age-specific fecundity of the captive North American red wolf population (includes data from 1980-present).

Demographic projections indicate that with a growth rate of approximately 4% ($\lambda = 1.043$) approximately 34 births will be needed in the coming year to begin to reach the population size of 250. With an average litter size of four and a 25% probability of each pair breeding successfully (based on data from pairings in past years), this demographic goal requires making approximately 34 pairings.

Genetics: Gene diversity in this population is 90% and is equivalent to the gene diversity of a population originating from approximately eight founders. Data from other mammalian species has shown that when gene diversity falls below 90%, reproduction is increasingly compromised by, among other factors, lower birth weights, smaller litter sizes, and greater neonatal mortality.

Gene diversity can be increased in the current population by pairing animals so that underrepresented lineages are bred (Figure 3). Pairing animals with the lowest mean kinships helps to equalize founder representation and should be considered a priority, as many genetically valuable animals may soon be too old to reproduce. To maintain gene diversity at 90% for a few more years, the population needs to increase in size and/or increase the proportion of breeders in the population. Gene diversity can be maintained at or above 85% for 16 years at the current population size and a growth rate of 4%, or for 23 years with a maximum population size of 250.

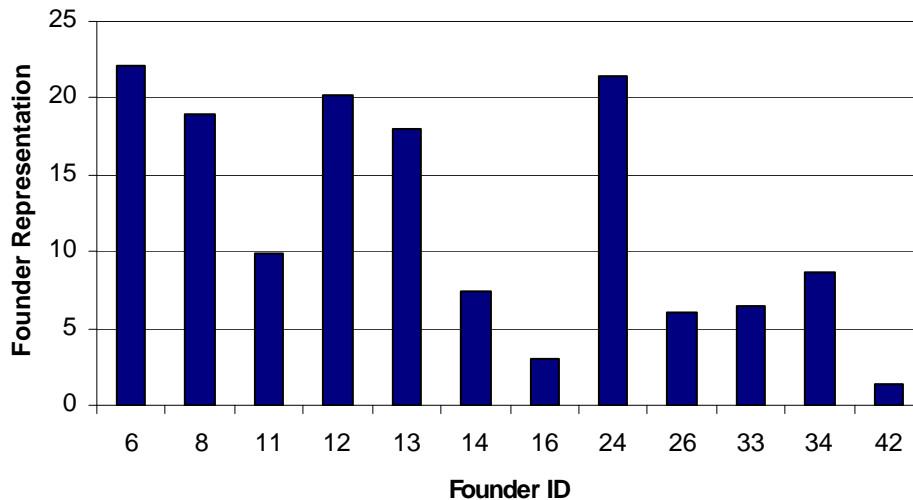


Figure 3. Founder representation in the 2001 North American captive red wolf population illustrating the unequal representation of various founder lineages.

Genetics Summary of Red Wolf SSP	2000	Current	Potential
Current Gene Diversity	90.4	90.4	94.0
Number of Founders	12	12	0
Founder Genome Equivalents	5.22	5.20	8.25
Founder Genome Surviving	8.34	8.25	8.25
Population Mean Kinship	0.0967	0.0961	
Mean Inbreeding	0.0537	0.0546	
% Known Pedigree	100	100	
Years To 90% Gene Diversity	0	0	
Gene Diversity at 100 Years From Present (%)	70.92	72.03	

Management Strategy: To achieve demographic and genetic goals, 34 births are recommended this year. The SSP recommends 34 pairs to achieve this goal, assuming a litter size of four and taking into account that many of these pairs may not successfully reproduce. As with all PMP and SSP populations, pairings are based on mean kinships, avoidance of inbreeding, avoidance of linking rare and common lineages, and logistical constraints identified by the participating institutions.

1. Recommend 34 breeding pairs.
2. Recommend ongoing reproductive evaluations of all females that are currently or will potentially be breeding. (For protocol, contact Karen Goodrowe, Reproductive Physiologist, Toronto Zoo at 416/392-5980 or kgoodrowe@zoo.metrotor.on.ca.)

SUMMARY BREEDING/TRANSFER PLAN

Red Wolf SSP 2001-2002

ID	Location	Sex	Age	Disposition	Location	Breeding	With
294	TACOMA	M	15	HOLD	TACOMA	BREED WITH	576
301	TACOMA	F	15	HOLD	TACOMA	DO NOT BREED	
342	FRESNO	F	13	HOLD	FRESNO	BREED WITH	511
348	PROVIDNCE	f	13	HOLD	PROVIDNCE	DO NOT BREED	
359	LOWRY	m	12	HOLD	LOWRY	DO NOT BREED	
364	TACOMA	F	12	HOLD	TACOMA	BREED WITH	790
387	SYRACUSE	M	12	HOLD	SYRACUSE	DO NOT BREED	
388	BINGHAMTO	F	12	HOLD	BINGHAMTO	DO NOT BREED	
390	FOSSILRIM	F	12	HOLD	FOSSILRIM	DO NOT BREED	
406	ALEXANDRI	M	11	SEND TO	NCSU-USFWS	DO NOT BREED	
409	TACOMA	F	11	HOLD	TACOMA	DO NOT BREED	
419	SIOUX FAL	F	11	HOLD	SIOUX FAL	DO NOT BREED	
432	ASHEVILLE	M	11	HOLD	ASHEVILLE	BREED WITH	983
436	TACOMA	M	11	HOLD	TACOMA	DO NOT BREED	
439	TACOMA	F	11	HOLD	TACOMA	DO NOT BREED	
441	ASHEBORO	F	11	HOLD	ASHBORO	BREED WITH	1091
469	LOWRY	M	10	HOLD	LOWRY	BREED WITH	725
471	ASHEBORO	M	10	HOLD	ASHEBORO	BREED WITH	919
477	BREVARD	M	10	HOLD	BREVARD	DO NOT BREED	
478	AWENDA	M	10	HOLD	AWENDA	BREED WITH	818
479	CARLOS AV	M	10	PENDING	TBD*	BREED WITH	726
481	TACOMA	M	10	HOLD	TACOMA	BREED WITH	792
482	ASHEBORO	M	10	HOLD	ASHEBORO	DO NOT BREED	
483	CARLOS AV	F	10	HOLD	CARLOS AV	BREED WITH	791
490	BLOOMINGT	M	10	HOLD	BLOOMINGT	DO NOT BREED	
491	WCSRC	M	10	HOLD	WCSRC	BREED WITH	819
492	TACOMA	M	10	HOLD	TACOMA	DO NOT BREED	
493	MILL MOUN	F	10	HOLD	MILL MOUN	BREED WITH	816
494	TALLAHASE	F	10	HOLD	TALLAHASE	BREED WITH	974
495	TACOMA	F	10	HOLD	TACOMA	BREED WITH	932
511	FRESNO	M	9	HOLD	FRESNO	BREED WITH	432
513	FOSSILRIM	M	9	HOLD	FOSSILRIM	DO NOT BREED	
514	FOSSILRIM	M	9	HOLD	FOSSILRIM	DO NOT BREED	
515	TACOMA	F	9	HOLD	TACOMA	DO NOT BREED	
516	CHATT NAT	F	9	HOLD	CHATT NAT	DO NOT BREED	
520	MANTEO	M	9	HOLD	MANTEO	DO NOT BREED	
521	AWENDA	M	9	HOLD	AWENDA	DO NOT BREED	
522	SPRINGFIE	F	9	HOLD	SPRINGFIE	DO NOT BREED	
531	ASHEVILLE	F	9	SEND TO	TACOMA	BREED WITH	924
533	CARLOS AV	F	9	HOLD	CARLOS AV	DO NOT BREED	
534	CARLOS AV	F	9	HOLD	CARLOS AV	DO NOT BREED	
535	CARLOS AV	F	9	HOLD	CARLOS AV	DO NOT BREED	
537	MANTEO	M	9	HOLD	MANTEO	DO NOT BREED	

ID	Location	Sex	Age	Disposition	Location	Breeding	With
543	TACOMA	M	9	HOLD	TACOMA	BREED WITH	606
545	RACINE	F	9	HOLD	RACINE	DO NOT BREED	
549	TALLAHASE	M	9	HOLD	TALLAHASE	DO NOT BREED	
550	ASHEBORO	F	9	HOLD	ASHEBORO	DO NOT BREED	
551	ASHEBORO	F	9	HOLD	ASHEBORO	DO NOT BREED	
557	VICTOR TX	F	9	HOLD	VICTOR TX	BREED WITH	1092
559	JACKSONVL	F	9	HOLD	JACKSONVL	BREED WITH	842
562	TACOMA	F	9	HOLD	TACOMA	BREED WITH	652
568	TACOMA	M	9	HOLD	TACOMA	BREED WITH	938
569	RACINE	M	9	SEND TO	TACOMA	BREED WITH	603
571	BRIDGEPRT	F	9	HOLD	BRIDGEPRT	BREED WITH	817
574	TACOMA	M	9	HOLD	TACOMA	BREED WITH	1098
576	TACOMA	F	9	HOLD	TACOMA	BREED WITH	294
578	LOWRY	F	9	HOLD	LOWRY	BREED WITH	653
579	FORTWORTH	F	9	HOLD	FORTWRTH	BREED WITH	605
603	TACOMA	F	8	HOLD	TACOMA	BREED WITH	569
604	TACOMA	F	8	PENDING	TBD*	BREED WITH	640
605	BINGHAMTO	M	8	SEND TO	FORTWRTH	BREED WITH	579
606	TACOMA	F	8	HOLD	TACOMA	BREED WITH	543
607	TACOMA	F	8	HOLD	TACOMA	BREED WITH	841
619	CARLOS AV	M	8	HOLD	CARLOS AV	DO NOT BREED	
620	CHATT NAT	M	8	HOLD	CHATT NAT	DO NOT BREED	
621	CARLOS AV	M	8	HOLD	CARLOS AV	DO NOT BREED	
622	KNOXVILLE	F	8	HOLD	KNOXVILLE	DO NOT BREED	
624	PROVIDNCE	F	8	HOLD	PROVIDNCE	BREED WITH	1097
629	ALEXANDRI	F	8	SEND TO	NCSU-USFWS	DO NOT BREED	
632	MANTEO	M	8	HOLD	MANTEO	DO NOT BREED	
636	TREVOR	M	8	HOLD	TREVOR	DO NOT BREED	
637	GOLDENPND	F	8	PENDING	TBD*	DO NOT BREED	
638	TACOMA	F	8	HOLD	TACOMA	DO NOT BREED	
640	AWENDA	M	8	PENDING	TBD*	BREED WITH	604
645	GREENBAY	M	8	HOLD	GREENBAY	DO NOT BREED	
646	GREENBAY	F	8	HOLD	GREENBAY	DO NOT BREED	
647	TALLAHASE	F	8	HOLD	TALLAHASE	DO NOT BREED	
648	TACOMA	F	8	HOLD	TACOMA	BREED WITH	939
651	TACOMA	M	8	HOLD	TACOMA	BREED WITH	925
652	TACOMA	M	8	HOLD	TACOMA	BREED WITH	562
653	LOWRY	M	8	HOLD	LOWRY	BREED WITH	578
687	TACOMA	M	7	HOLD	TACOMA	DO NOT BREED	
688	TACOMA	M	7	HOLD	TACOMA	DO NOT BREED	
689	SPRINGFIE	M	7	HOLD	SPRINGFIE	DO NOT BREED	
690	SYRACUSE	F	7	HOLD	SYRACUSE	DO NOT BREED	
692	FOSSILRIM	F	7	HOLD	FOSSILRIM	DO NOT BREED	
701	TACOMA	M	7	HOLD	TACOMA	DO NOT BREED	
702	TACOMA	M	7	HOLD	TACOMA	DO NOT BREED	
703	TACOMA	F	7	HOLD	TACOMA	DO NOT BREED	

ID	Location	Sex	Age	Disposition	Location	Breeding	With
704	TACOMA	F	7	HOLD	TACOMA	DO NOT BREED	
705	TACOMA	F	7	HOLD	TACOMA	DO NOT BREED	
719	MANTEO	F	7	HOLD	MANTEO	DO NOT BREED	
720	MANTEO	F	7	HOLD	MANTEO	DO NOT BREED	
722	GOLDENPND	M	7	PENDING	TBD*	BREED WITH	937
723	AWENDA	M	7	HOLD	AWENDA	DO NOT BREED	
724	AWENDA	M	7	HOLD	AWENDA	DO NOT BREED	
725	LOWRY	F	7	HOLD	LOWRY	BREED WITH	469
726	LOWRY	F	7	PENDING	TBD*	BREED WITH	479
729	MILL MOUN	M	7	PENDING	TBD*	DO NOT BREED	
730	ASHEBORO	F	7	HOLD	ASHEBORO	DO NOT BREED	
740	BLOOMINGT	M	7	HOLD	BLOOMINGT	DO NOT BREED	
742	BLOOMINGT	M	7	HOLD	BLOOMINGT	DO NOT BREED	
743	WCSRC	F	7	HOLD	WCSRC	DO NOT BREED	
744	WCSRC	F	7	HOLD	WCSRC	DO NOT BREED	
790	TACOMA	M	6	HOLD	TACOMA	BREED WITH	364
791	CARLOS AV	M	6	HOLD	CARLOS AV	BREED WITH	483
792	TACOMA	F	6	HOLD	TACOMA	BREED WITH	481
793	BREVARD	F	6	HOLD	BREVARD	DO NOT BREED	
816	TALLAHASE	M	5	SEND TO	MILL MOUN	BREED WITH	493
817	BRIDGEPRT	M	5	HOLD	BRIDGEPRT	BREED WITH	571
818	AWENDA	F	5	HOLD	AWENDA	BREED WITH	478
819	WCSRC	F	5	HOLD	WCSRC	BREED WITH	491
841	VICTOR TX	M	5	SEND TO	TACOMA	BREED WITH	607
842	JACKSONVL	M	5	HOLD	JACKSONVL	BREED WITH	559
917	KNOXVILLE	m	4	HOLD	KNOXVILLE	DO NOT BREED	
918	DURHAN MS	F	4	HOLD	DURHAN MS	BREED WITH	953
919	ASHEBORO	F	4	HOLD	ASHEBORO	BREED WITH	471
921	ASHEBORO	F	4	SEND TO	ALEXANDRI	BREED WITH	923
923	TACOMA	M	4	SEND TO	ALEXANDRI	BREED WITH	921
924	TACOMA	M	4	HOLD	TACOMA	BREED WITH	531
925	TACOMA	F	4	HOLD	TACOMA	BREED WITH	651
932	MANTEO	M	4	SEND TO	TACOMA	BREED WITH	495
937	MANTEO	F	4	PENDING	TBD*	BREED WITH	722
938	TACOMA	F	4	HOLD	TACOMA	BREED WITH	568
939	TACOMA	M	4	HOLD	TACOMA	BREED WITH	648
952	MANTEO	F	3	HOLD	MANTEO	DO NOT BREED	
953	DURHAN MS	M	3	HOLD	DURHAN MS	BREED WITH	918
956	SIOUX FAL	M	3	HOLD	SIOUX FAL	DO NOT BREED	
957	SIOUX FAL	M	3	HOLD	SIOUX FAL	DO NOT BREED	
958	SIOUX FAL	F	3	HOLD	SIOUX FAL	DO NOT BREED	
974	MANTEO	M	3	SEND TO	TALLAHASE	BREED WITH	494
983	MANTEO	F	3	SEND TO	ASHEVILLE	BREED WITH	432
1009	TACOMA	F	2	HOLD	TACOMA	DO NOT BREED	
1010	TACOMA	F	2	HOLD	TACOMA	DO NOT BREED	
1020	WHEELING	M	2	HOLD	WHEELING	DO NOT BREED	

ID	Location	Sex	Age	Disposition	Location	Breeding	With
1021	WHEELING	F	2	HOLD	WHEELING	DO NOT BREED	
1091	ASHEVILLE	M	1	SEND TO	ASHEBORO	BREED WITH	441
1092	ASHEVILLE	M	1	SEND TO	VICTOR TX	BREED WITH	557
1095	TACOMA	M	1	HOLD	TACOMA	DO NOT BREED	
1096	TACOMA	F	1	HOLD	TACOMA	DO NOT BREED	
1097	TACOMA	M	1	SEND TO	PROVIDNCE	BREED WITH	624
1098	TACOMA	F	1	HOLD	TACOMA	BREED WITH	574
1117	WCSRC	M	0	HOLD	WCSRC	DO NOT BREED	
1118	WCSRC	F	0	HOLD	WCSRC	DO NOT BREED	
1121	RACINE	M	0	HOLD	RACINE	DO NOT BREED	
1122	RACINE	M	0	HOLD	RACINE	DO NOT BREED	
1123	RACINE	F	0	HOLD	RACINE	DO NOT BREED	
1124	BREVARD	M	0	HOLD	BREVARD	DO NOT BREED	
1125	BREVARD	M	0	HOLD	BREVARD	DO NOT BREED	
1126	BRIDGEPRT	F	0	HOLD	BRIDGEPRT	DO NOT BREED	
1127	BRIDGEPRT	F	0	HOLD	BRIDGEPRT	DO NOT BREED	
1128	BREVARD	F	0	HOLD	BREVARD	DO NOT BREED	
1129	BREVARD	F	0	HOLD	BREVARD	DO NOT BREED	
1130	BREVARD	F	0	HOLD	BREVARD	DO NOT BREED	
1131	BRIDGEPRT	M	0	HOLD	BRIDGEPRT	DO NOT BREED	

BREEDING & TRANSFER PLANS by INSTITUTION

Institution: ALEXANDRI

Alexandria Zoological Park
P.O. Box 71
Alexandria, LA, 71301-4240
Leslie Whitt, Director
(318)473-1385

Institutional notes: **Receive** as breeding pair 921F from Asheboro and 923M from Tacoma.

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
406	M	11	SEND TO	NCSU-USFWS	DO NOT BREED		
629	F	8	SEND TO	NCSU-USFWS	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations
1 male, 1 female **after** recommendations

Institution: ASHEBORO

North Carolina Zoological Park
4401 Zoo Pkwy.
Asheboro, NC, 27203-9416
Lorraine Smith, Curator of Mammals
(336)879-7603

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
441	F	11	HOLD	ASHEBORO	BREED WITH	1091	Receive 1091M from Asheville. 441 has had breeding opportunity last two years. Her age and previous history with MGA limits breeding success. First breeding opportunity for 1091.
471	M	10	HOLD	ASHEBORO	BREED WITH	919	Male is proven. The last two years he was paired with 441. First breeding opportunity for 919F.
482	M	10	HOLD	ASHEBORO	DO NOT BREED		
550	F	9	HOLD	ASHEBORO	DO NOT BREED		
551	F	9	HOLD	ASHEBORO	DO NOT BREED		
730	F	7	HOLD	ASHEBORO	DO NOT BREED		
919	F	4	HOLD	ASHEBORO	BREED WITH	471	See above
921	F	4	SEND TO	ALEXANDRI	BREED WITH	923	923M current location is Tacoma. Last year was his first breeding opportunity. This will be 921 first breeding opportunity. Pair will be established at Alexandria Zoo.

Summary:

2 males, 6 females **before** recommendations
3 males, 5 females **after** recommendations

Institution: ASHEVILLE

Western NC Nature Center
 Gashes Creek Rd.
 Asheville, NC, 28805
 Weston Utter, Animal Curator
 (828)298-5600 x309

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
432	M	11	HOLD	ASHEVILLE	BREED WITH	983	Receive 983F from Manteo. Male is proven. First captive breeding opportunity for female.
531	F	9	SEND TO	TACOMA	BREED WITH	924	Female is proven but age may be factor. Male has had previous breeding opportunities but is unproven.
1091	M	1	SEND TO	ASHEBORO	BREED WITH	441	First breeding opportunity for 1091. 441F has had breeding opportunity last two years. Her age and previous history with MGA limits breeding success.
1092	M	1	SEND TO	VICTOR TX	BREED WITH	557	First breeding opportunity for 1092. Last year was 557F first breeding opportunity and did not produce pups.

Summary:

3 males, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: AWENDA

Cape Romain National Wildlife Refuge
 390 Bulls Island Rd.
 Awenda, SC, 29429
 George Garris, Refuge Manager
 (843)928-3264

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
478	M	10	HOLD	AWENDA	BREED WITH	818	Pair established last year at Sewee and was first breeding opportunity for both wolves. No pups.
521	M	9	HOLD	AWENDA	DO NOT BREED		
640	M	8			BREED WITH	604	604F currently at Tacoma. Pairing location to be determined.
723	M	7	HOLD	AWENDA	DO NOT BREED		Housed at Sewee
724	M	7	HOLD	AWENDA	DO NOT BREED		Housed at Sewee
818	F	5	HOLD	AWENDA	BREED WITH	478	Pair established last year at Sewee and was first breeding opportunity for both wolves. No pups.

Summary:

5 males, 1 female **before** recommendations
after recommendations to be determined

Institution: BINGHAMTO

Ross Park Zoo
 185 Park Ave.
 Binghamton, NY, 13903
 Steve Contento, Director
 (607)724-5461

Institutional notes: Male to replace 605 to be determined.

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
388	F	12	HOLD	BINGHAMTO	DO NOT BREED		Female has had breeding opportunities in the past. Reproductive history and age make reproduction unlikely.
605	M	8	SEND TO	FT WORTH	BREED WITH	579	Male is proven. First breeding opportunity for 579F

Summary:

1 male, 1 female **before** recommendations

1 male, 1 female **after** recommendations

Institution: BLOOMINGT

Miller Park Zoo
 1020 S Morris Ave.
 Bloomington, IL, 61701-6351
 John Tobias, Director
 (309)434-2825

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
490	M	10	HOLD	BLOOMINGT	DO NOT BREED		
740	M	7	HOLD	BLOOMINGT	DO NOT BREED		
742	M	7	HOLD	BLOOMINGT	DO NOT BREED		

Summary:

3 males, 0 female **before** recommendations

3 males, 0 female **after** recommendations

Institution: BREVARD

Brevard Zoo
 8225 N. Wickham Rd.
 Melbourne, FL, 32940-7924
 Michelle Smurl, Curator
 (321)254-9453 x17

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
477	M	10	HOLD	BREVARD	DO NOT BREED		
793	F	6	HOLD	BREVARD	DO NOT BREED		
1124	M	0	HOLD	BREVARD	DO NOT BREED		
1125	M	0	HOLD	BREVARD	DO NOT BREED		
1128	F	0	HOLD	BREVARD	DO NOT BREED		
1129	F	0	HOLD	BREVARD	DO NOT BREED		
1130	F	0	HOLD	BREVARD	DO NOT BREED		

Summary:

3 males, 4 females **before** recommendations
 3 males, 4 females **after** recommendations

Institution: BRIDGEPRT

Beardsley Zoological Gardens
 1875 Noble Ave.
 Bridgeport, CT, 06610
 Don Goff, General Curator
 (203)394-6564

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
571	F	9	HOLD	BRIDGEPRT	BREED WITH	817	Maintain in family group as breeding pair
817	M	5	HOLD	BRIDGEPRT	BREED WITH	571	Maintain in family group as breeding pair
1126	F	0	HOLD	BRIDGEPRT	DO NOT BREED		
1127	F	0	HOLD	BRIDGEPRT	DO NOT BREED		
1131	M	0	HOLD	BRIDGEPRT	DO NOT BREED		

Summary:

2 males, 3 females, **before** recommendations
 2 males, 3 females, **after** recommendations

Institution: CARLOS AV

Wildlife Science Center (Carlos Avery)
 5463 West Broadway
 Forest Lake, MN, 55025
 Margaret Callahan, Director
 (651)464-3993

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
479	M	10			BREED WITH	726	726F current location is Lowry Park. Pairing location to be determined.
483	F	10	HOLD	CARLOS AV	BREED WITH	791	Paired with 791M last year and was first breeding opportunity for 483. Male is proven but female's age may limit breeding success.
533	F	9	HOLD	CARLOS AV	DO NOT BREED		
534	F	9	HOLD	CARLOS AV	DO NOT BREED		
535	F	9	HOLD	CARLOS AV	DO NOT BREED		
619	M	8	HOLD	CARLOS AV	DO NOT BREED		
621	M	8	HOLD	CARLOS AV	DO NOT BREED		
791	M	6	HOLD	CARLOS AV	BREED WITH	483	Paired with 483F last year and was her first breeding opportunity. Male is proven but female's age may limit breeding success.

Summary:

4 males, 4 females **before** recommendations
after recommendations to be determined

Institution: CHATT NAT

Tennessee Wildlife Center
 400 Garden Road
 Chattanooga, TN, 37419
 Susie Matthews, DVM, Asst. Director
 (423)821-1160 x109

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
516	F	9	HOLD	CHATT NAT	DO NOT BREED		
620	M	8	HOLD	CHATT NAT	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: DURHAN MS

N C Museum of Life and Science
 433 Murray Ave.
 Durham, NC, 27704
 Sherry Samuels, Animal Director
 (919)220-5429 x333

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
918	F	4	HOLD	DURHAN MS	BREED WITH	953	Last year was first breeding opportunity for both wolves. No pups but pair was likely established too late in breeding season
953	M	3	HOLD	DURHAN MS	BREED WITH	918	See above

Summary:

1 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: FORTWORTH

Fort Worth Zoo
 1989 Colonial Parkway
 Fort Worth, Texas 76110
 Stacey Johnson, Curator
 (817)759-7190

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
579	F	9	HOLD	FT WORTH	BREED WITH	605	Receive 605M from Ross Park. 605M is proven. First breeding opportunity for 579F. Her age may be a factor.

Summary:

0 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: FOSSILRIM

Fossil Rim Wildlife Center
 P.O. Box 2189
 Glen Rose, TX, 76043
 Mary Jo Stearns, Curator
 (254)897-2960 x314

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
390	F	12	HOLD	FOSSIL RIM	DO NOT BREED		
513	M	9	HOLD	FOSSIL RIM	DO NOT BREED		
514	M	9	HOLD	FOSSIL RIM	DO NOT BREED		
692	F	7	HOLD	FOSSIL RIM	DO NOT BREED		

Summary:

2 male, 2 female **before** recommendations

2 male, 2 female **after** recommendations

Institution: FRESNO

Chaffee Zool Gardens of Fresno
 894 W Belmont Ave.
 Fresno, CA, 93728-2891
 Barb Pfeifer, Assistant Director
 (559)498-4760

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
342	F	13	HOLD	FRESNO	BREED WITH	511	Keep paired together for third season. Female has had one litter in 1993, but has not had litter since. Female's age limiting factor for successful breeding. She is most valuable female, ranked #1 on mean kinship list.
511	M	9	HOLD	FRESNO	BREED WITH	342	See above. 342F is only breeding female 511M has been with.

Summary:

1 male, 1 female **before** recommendations

1 male, 1 female **after** recommendations

Institution: GOLDENPND

Land Between the Lakes
100 Van Morgan Dr.
Golden Pond, KY, 42211
Steve Bloemer, Biologist
(270)924-2000

Institutional notes: Disposition and location to be determined.

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
637	F	8			DO NOT BREED		
722	M	7			BREED WITH	937	937F currently at Manteo.

Summary:

1 male, 1 female **before** recommendations
after recommendations to be determined

Institution: GREENBAY

NEW Zoo
P.O. Box 23600
Green Bay, WI, 54305-3600
Neil Anderson, Director
(920)434-8597

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
645	M	8	HOLD	GREENBAY	DO NOT BREED		
646	F	8	HOLD	GREENBAY	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations
1 male, 1 female **after** recommendations

Institution: JACKSONVL

Jacksonville Zoological Gardens
 8605 Zoo Parkway
 Jacksonville, FL, 32218-5769
 Craig Miller, Curator of Mammals
 (904)757-4463 x136

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
559	F	9	HOLD	JACKSONVL	BREED WITH	842	Pair established last year but no pups. Last year was first breeding opportunity for both wolves. Maintain pairing again this breeding season.
842	M	5	HOLD	JACKSONVL	BREED WITH	559	See above.

Summary:

1 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: KNOXVILLE

Knoxville Zoological Gardens
 P.O. Box 6040
 Knoxville, TN, 37914
 Lisa New, Curator of Mammals
 (865)637-5331 x329

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
622	F	8	HOLD	KNOXVILLE	DO NOT BREED		
917	m	4	HOLD	KNOXVILLE	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: LOWRY

Lowry Park Zoological Garden
 7530 North Blvd.
 Tampa, FL, 33604-4756
 Jennifer Hackshaw, General Curator
 (813)935-8552 x221

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
359	m	12	HOLD	LOWRY	DO NOT BREED		
469	M	10	HOLD	LOWRY	BREED WITH	725	New pairing. First breeding opportunity for both wolves.
578	F	9	HOLD	LOWRY	BREED WITH	653	Pair established last year but no pups. Maintain pairing again this breeding season.
653	M	8	HOLD	LOWRY	BREED WITH	578	See above.
726	F	7			BREED WITH	479	479M current location is Wildlife Science Center (Carlos Avery). First breeding opportunity for both wolves. Female has been implanted with MGA. Location to be determined.
725	F	7	HOLD	LOWRY	BREED WITH	469	New pairing. First breeding opportunity for both wolves.

Summary:

3 males, 3 females **before** recommendations
after recommendations to be determined

Institution: MANTEO

Alligator River National Wildlife Refuge
 P.O. Box 1969
 Manteo, NC, 27954
 Buddy Fazio, Team Leader
 (919)473-1131

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
520	M	9	HOLD	MANTEO	DO NOT BREED		
537	M	9	HOLD	MANTEO	DO NOT BREED		
632	M	8	HOLD	MANTEO	DO NOT BREED		
719	F	7	HOLD	MANTEO	DO NOT BREED		
720	F	7	HOLD	MANTEO	DO NOT BREED		
932	M	4	SEND TO	TACOMA	BREED WITH	495	New pairing. 495F is proven (pups disappeared & presumed eaten by female). This is 932M first captive breeding opportunity. Female's age limits breeding success.
937	F	4			BREED WITH	722	722M currently located at LBL. First breeding opportunity for both wolves. Location to be determined.
952	F	3	HOLD	MANTEO	DO NOT BREED		
974	M	3	SEND TO	TALLAHASSEE	BREED WITH	494	New pairing. 494F has been paired for breeding but has not produced offspring. This is 974M first captive breeding opportunity. Female's age limits breeding success.
983	F	3	SEND TO	ASHEVILLE	BREED WITH	432	New pairing. 432M is proven breeder. This is 983F first captive breeding opportunity.

Summary:

5 males, 5 females **before** recommendations
after recommendations to be determined

Institution: MILL MOUN

Mill Mountain Zoo
 P.O. Box 13484
 Roanoke, VA, 24034
 Laurie Spangler, Cons. Coordinator
 (540)343-3241

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
493	F	10	HOLD	MILL MOUN	BREED WITH	816	Receive 816M from Tallahassee. New pairing. Male has been paired for two season but female he was with was questionable. 493F had litter when younger but her age may limit breeding success.
729	M	7			DO NOT BREED		Transfer location to be determined.

Summary:

1 male, 1 female **before** recommendations
after recommendations to be determined

Institution: NCSU-USFWS

Institutional notes: New facility at North Carolina State University, Raleigh, NC in cooperation with USFWS, Manteo, NC.
 Department of Clinical Sciences
 College of Veterinary Medicine
 North Carolina State University
 4700 Hillsborough St.
 Raleigh, NC 27606
 Michael Stoskopf, DVM
 (919)513-6279

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
406	M	11		NCSU-USFWS	DO NOT BREED		Receive 406M from Alexandria Zoo
629	F	8		NCSU-USFWS	DO NOT BREED		Receive 629F from Alexandria Zoo

Summary:

0 males, 0 females **before** recommendations
 1 male, 1 female **after** recommendations

Institution: PROVIDNCE

Roger Williams Park Zoo
 1000 Elmwood Ave.
 Providence, RI, 02907-3600
 Amos Morris, Curator
 (401)785-3510 x306

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
348	f	13	HOLD	PROVIDNCE	DO NOT BREED		
624	F	8	HOLD	PROVIDNCE	BREED WITH	1097	Receive 1097M from Tacoma. New pairing. First breeding opportunity for both wolves.

Summary:

0 males, 2 females **before** recommendations
 1 male, 2 females **after** recommendations

Institution: RACINE

Racine Zoological Garden
2131 N Main St.
Racine, WI, 53402
Shane Siers, Dir. of Conservation
(262)636-9308

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
545	F	9	HOLD	RACINE	DO NOT BREED		
569	M	9	SEND TO	TACOMA	BREED WITH	603	New pairing. Both wolves are proven breeders.
1121	M	0	HOLD	RACINE	DO NOT BREED		
1122	M	0	HOLD	RACINE	DO NOT BREED		
1123	F	0	HOLD	RACINE	DO NOT BREED		

Summary:

3 males, 2 females **before** recommendations
2 males, 2 females **after** recommendations

Institution: SIOUX FAL

Great Plains Zoo
805 S Kiwanis
Sioux Falls, SD, 57104-3714
Dan Brands, Director
(605)367-7003

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
419	F	11	HOLD	SIOUX FAL	DO NOT BREED		
956	M	3	HOLD	SIOUX FAL	DO NOT BREED		
957	M	3	HOLD	SIOUX FAL	DO NOT BREED		
958	F	3	HOLD	SIOUX FAL	DO NOT BREED		

Summary:

2 males, 2 females **before** recommendations
2 males, 2 females **after** recommendations

Institution: SPRINGFIE

Henson Robinson Zoo
 1100 E Lake Dr.
 Springfield, IL, 62707
 Talon Thorton, Director
 (217)753-6217

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
522	F	9	HOLD	SPRINGFIE	DO NOT BREED		
689	M	7	HOLD	SPRINGFIE	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: SYRACUSE

Burnet Park Zoo (Rosamond Gifford Zoo)
 1 Conservation Place
 Syracuse, NY, 13204-2504
 Tom LaBarge, Large Mammals Mgr.
 (315)435-8511

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
387	M	12	HOLD	SYRACUSE	DO NOT BREED		
690	F	7	HOLD	SYRACUSE	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations
 1 male, 1 female **after** recommendations

Institution: TACOMA

Point Defiance Zoo & Aquarium

5400 N Pearl St.

Tacoma, WA, 98407-3218

Will Waddell, RWSSP Coordinator

(253)858-9172

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
294	M	15	HOLD	TACOMA	BREED WITH	576	Pair has been housed together for a couple of years more for space reasons than breeding. Reproduction is unlikely given age of male.
301	F	15	HOLD	TACOMA	DO NOT BREED		
364	F	12	HOLD	TACOMA	BREED WITH	790	Paired together last year but no pups. Female is genetically important but has never produced litter. Female appeared to cycle last year based on fecal analysis, but her age limits breeding success.
409	F	11	HOLD	TACOMA	DO NOT BREED		
436	M	11	HOLD	TACOMA	DO NOT BREED		
439	F	11	HOLD	TACOMA	DO NOT BREED		
481	M	10	HOLD	TACOMA	BREED WITH	792	This pair was established two seasons ago but no pups. Paired again last season after 481M became aggressive toward new female. Male has had one litter in past, female is unproven.
492	M	10	HOLD	TACOMA	DO NOT BREED		
495	F	10	HOLD	TACOMA	BREED WITH	932	Receive 932M from Manteo. New pairing. 495F is proven (pups disappeared & presumed eaten by female). This is 932M first captive breeding opportunity. Female's age limits breeding success.
515	F	9	HOLD	TACOMA	DO NOT BREED		
543	M	9	HOLD	TACOMA	BREED WITH	606	Pair was housed together last year for space reasons and unlikely possibility of breeding. Female implanted with MGA in the past. Maintain pairing.
562	F	9	HOLD	TACOMA	BREED WITH	652	This pairing was made during breeding season last year because original male (568) was aspermic at semen collection. Litter of two born this year but did not survive.
568	M	9	HOLD	TACOMA	BREED WITH	938	568M aspermic during semen collection last year when with another female (see above). 938F missing front leg and has not produced litter. May consider AI.
574	M	9	HOLD	TACOMA	BREED WITH	1098	New pairing. First breeding opportunity for 1098F.
576	F	9	HOLD	TACOMA	BREED WITH	294	See Tacoma notes entry number one.
603	F	8	HOLD	TACOMA	BREED WITH	569	Receive 569M from Racine. New pairing. Both are proven breeders. Plan to pull or foster pups given this female's history of killing offspring.
604	F	8			BREED WITH	640	640M currently located at Awenda. Pairing location to be determined.
606	F	8	HOLD	TACOMA	BREED WITH	543	See Tacoma notes entry number eight.
607	F	8	HOLD	TACOMA	BREED WITH	841	Receive 841M from Texas Zoo. New pairing. Last year was first breeding opportunity for male but no pups with female he was paired with. Female is proven.
638	F	8	HOLD	TACOMA	DO NOT BREED		
648	F	8	HOLD	TACOMA	BREED WITH	939	Pair established last year. Was first breeding opportunity for 939M. Female has had breeding opportunities but no pups. Keep paired this season.
651	M	8	HOLD	TACOMA	BREED WITH	925	Pair established last year. 651M has had breeding opportunities but has not produced pups although previous female's may have been questionable. Last year was first opportunity for 925F. Keep paired.
652	M	8	HOLD	TACOMA	BREED WITH	562	See Tacoma notes entry number nine.

687	M	7	HOLD	TACOMA	DO NOT BREED		
688	M	7	HOLD	TACOMA	DO NOT BREED		
701	M	7	HOLD	TACOMA	DO NOT BREED		
702	M	7	HOLD	TACOMA	DO NOT BREED		
703	F	7	HOLD	TACOMA	DO NOT BREED		
704	F	7	HOLD	TACOMA	DO NOT BREED		
705	F	7	HOLD	TACOMA	DO NOT BREED		
790	M	6	HOLD	TACOMA	BREED WITH	364	See Tacoma notes entry number two
792	F	6	HOLD	TACOMA	BREED WITH	481	See Tacoma notes entry number four
923	M	4	SEND TO	ALEXANDRI	BREED WITH	921	921F current location NCZoo. New pairing to be established at Alexandria Zoo.
924	M	4	HOLD	TACOMA	BREED WITH	531	Receive 531F from Asheville. New pairing. Female is proven but age may be factor. Male has had previous breeding opportunities but is unproven.
925	F	4	HOLD	TACOMA	BREED WITH	651	See Tacoma notes entry number nineteen
938	F	4	HOLD	TACOMA	BREED WITH	568	See Tacoma notes entry number ten
939	M	4	HOLD	TACOMA	BREED WITH	648	See Tacoma notes entry number eighteen
1009	F	2	HOLD	TACOMA	DO NOT BREED		
1010	F	2	HOLD	TACOMA	DO NOT BREED		
1095	M	1	HOLD	TACOMA	DO NOT BREED		
1096	F	1	HOLD	TACOMA	DO NOT BREED		
1097	M	1	SEND TO	PROVIDNCE	BREED WITH	624	New pairing. First breeding opportunity for both wolves
1098	F	1	HOLD	TACOMA	BREED WITH	574	See Tacoma notes entry number eleven

Summary:

19 males, 24 females **before** recommendations
after recommendations to be determined

Institution: TALLAHASE

Tallahassee Mus.History & Natural Sc
 3945 Museum Dr.
 Tallahassee, FL, 32310
 Mike Jones, Animal Curator
 (904)575-8685

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
494	F	10	HOLD	TALLAHASE	BREED WITH	974	Receive 974M from Manteo. New pairing. This is 974M first captive breeding opportunity. 494F has been paired for breeding but has not produced offspring. Female's age limits breeding success.
549	M	9	HOLD	TALLAHASE	DO NOT BREED		
647	F	8	HOLD	TALLAHASE	DO NOT BREED		
816	M	5	SEND TO	MILL MOUN	BREED WITH	493	New pairing. Male has been paired for two season but female he was with was questionable. 493F had litter when younger but her age may limit breeding success.

Summary:

2 males, 2 females **before** recommendations
 2 males, 2 females **after** recommendations

Institution: TREVOR

Trevor Zoo
 Millbrook School Rd.
 Millbrook, NY, 12545
 John Meigs, Director
 (845)677-3704

Institutional notes: This male has been diagnosed with progressive retinal atrophy and will likely be euthanized. Replacement wolves to be determined.

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
636	M	8	HOLD	TREVOR	DO NOT BREED		

Summary:

1 male, 0 female **before** recommendations
after recommendations to be determined

Institution: VICTOR TX

Texas Zoo
 110 Memorial Dr.
 Victoria, TX, 77901
 Jean Benchimol, Director
 (361)573-7681

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
557	F	9	HOLD	VICTOR TX	BREED WITH	1092	Receive 1092M from Asheville. New pairing. Last year was first breeding opportunity for 557F but no pups. First breeding opportunity for this male.
841	M	5	SEND TO	TACOMA	BREED WITH	607	New pairing. Last year was first breeding opportunity for 841M and the female he was paired with but no pups. 607F is proven breeder.

Summary:

1 male, 1 female **before** recommendations

1 male, 1 female **after** recommendations

Institution: WCSRC

Wild Canid Survival & Res Center
 P.O. Box 760
 Eureka, MO, 63025
 Sue Lindsey, Executive Director
 (636)938-6490

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
491	M	10	HOLD	WCSRC	BREED WITH	819	Pair established last year and produced litter. Maintain as breeding pair at WCSRC again this year.
743	F	7	HOLD	WCSRC	DO NOT BREED		
744	F	7	HOLD	WCSRC	DO NOT BREED		
819	F	5	HOLD	WCSRC	BREED WITH	491	See above.
1117	M	0	HOLD	WCSRC	DO NOT BREED		
1118	F	0	HOLD	WCSRC	DO NOT BREED		

Summary:

2 males, 4 females **before** recommendations

2 males, 4 females **after** recommendations

Institution: WHEELING

Oglebay's Good Children's Zoo
Oglebay Park
Wheeling, WV, 26003
Penny Miller, Director
(304)243-4027

ID	Sex	Age	Disposition	Location	Breeding	With	Notes
1020	M	2	HOLD	WHEELING	DO NOT BREED		
1021	F	2	HOLD	WHEELING	DO NOT BREED		

Summary:

1 male, 1 female **before** recommendations

1 male, 1 female **after** recommendations

Appendix A

Summary of Data Used to Prepare Breeding & Transfer Plan

Project: RedWolfcap

Report compiled under Population Management 2000, version 1.12

2:34:40 PM, 7/12/2001

Comments: From meeting July 13-14th 2001 at Henson Robinson Zoo in Springfield, Illinois

Demographic data from: C:\SPARKS\redwork\MRWcap.PRN and C:\SPARKS\redwork\FRWcap.PRN

Data exported on: 12 Jul 2001

Data compiled by: WILLIAM WADDELL

Data current thru: 4 Jun 2001

Scope of data:

Filter Conditions In Effect: Dates: Between 01/01/1980 and 11/07/2001

User Defined Fields: "C" \$ upper(CAPFREE)

Genetic data from: C:\SPARKS\redwork\RedWolfcap.ped

Dates: As of 11/07/2001

Status: Living on 11 Jul 2001

Report prepared by: Sarah T. Long, Population Biologist, AZA Population Management Center

Appendix B

List of Individuals Excluded from the Genetic Analyses

Studbook ID	Local ID	Location	Sex	Reason
301	301	TACOMA	Female	
342	990114	FRESNO	Female	
348	911002	PROVIDNCE	Neutered Female	sterile
359	100236	LOWRY	Neutered Male	sterile
386	5040	FOSSILRIM	Male	Lost to Followup
388	901326	BINGHAMTO	Female	
390	_____	FOSSILRIM	Female	
409	409	TACOMA	Female	
419	1439	SIOUX FAL	Female	
439	439	TACOMA	Female	
636	93M423	TREVOR	Male	
917	1896	KNOXVILLE	Neutered Male	sterile

Appendix C Life Tables

Males

Age (x)	Px	lx	Mx	Vx	Ex	Risk-Qx	Risk-Mx
0	0.6	0.4	1	0	1.25	6.703	276.9
1	0.9	0.1	0.6	0.05	1.85	8.005	163.8
2	0.94	0.06	0.54	0.3	2.066	7.622	146.9
3	0.93	0.07	0.508	0.44	1.992	7.082	136.6
4	0.94	0.06	0.472	0.39	1.751	6.506	123.6
5	0.93	0.07	0.444	0.23	1.534	5.887	111.5
6	0.92	0.08	0.413	0.27	1.487	5.283	102.9
7	0.86	0.14	0.38	0.25	1.44	4.805	87.4
8	0.89	0.11	0.327	0.29	1.436	4.354	65.5
9	0.84	0.16	0.291	0.36	1.395	3.872	49.7
10	0.75	0.25	0.244	0.44	1.367	3.594	31.9
11	0.95	0.05	0.183	0.26	1.17	3.104	19.6
12	0.55	0.45	0.174	0.35	1.27	2.787	15.5
13	1	0	0.096	0.69	1.368	2.518	8
14	0.5	0.5	0.096	0.44	0.953	2.023	8
15	0.69	0.31	0.048	0.96	0.96	1.817	3.2
16	0.5	0.5	0.033	0	0	1.333	2
17	0	1	0.017	0	0	1	1
18	0	1	0	0	0	0	0
19	0	1	0	0	0	0	0

r = 0.0532

N = 75.50

lambda = 1.0546

N(at 20 yrs) = 218.80

T = 6.09

Females

Age (x)	Px	lx	Mx	Vx	Ex	Risk-Qx	Risk-Mx
0	0.57	0.43	1	0.02	1.274	6.735	303.2
1	0.92	0.08	0.57	0.13	1.845	8.227	172.8
2	0.94	0.06	0.524	0.2	1.892	7.774	156.9
3	0.94	0.06	0.493	0.3	1.846	7.207	145.6
4	0.93	0.07	0.463	0.38	1.696	6.637	131.6
5	0.96	0.04	0.431	0.34	1.429	5.969	119.9
6	0.93	0.07	0.414	0.27	1.181	5.256	112.6
7	0.91	0.09	0.385	0.3	1.016	4.624	96
8	0.88	0.12	0.35	0.27	0.819	4.046	75.7
9	0.85	0.15	0.308	0.36	0.651	3.518	52.7
10	0.84	0.16	0.262	0.23	0.352	2.978	37.7
11	0.72	0.28	0.22	0.16	0.16	2.52	28.3
12	0.64	0.36	0.158	0	0	2.213	16.5
13	0.64	0.36	0.101	0	0	1.896	8.3
14	0.6	0.4	0.065	0	0	1.435	5
15	0.08	0.92	0.039	0	0	1.074	2.2
16	0	1	0.003	0	0	1	0
17	0	1	0	0	0	0	0
18	0	1	0	0	0	0	0
19	0	1	0	0	0	0	0

r = 0.0253

lambda = 1.0256

N = 80.50

N(at 20 yrs) = 133.51

T = 5.54

Appendix D Ordered Mean Kinship List

Males					Females				
SB#	MK	%Known	Age	Location	SB#	MK	%Known	Age	Location
924	0.082	100.00	4	TACOMA	364	0.077	100.00	12	TACOMA
923	0.082	100.00	4	TACOMA	925	0.082	100.00	4	TACOMA
568	0.087	100.00	9	TACOMA	531	0.083	100.00	9	ASHEVILLE
1091	0.088	100.00	1	ASHEVILLE	562	0.087	100.00	9	TACOMA
1092	0.088	100.00	1	ASHEVILLE	578	0.087	100.00	9	LOWRY
939	0.089	100.00	4	TACOMA	441	0.087	100.00	11	ASHEBORO
569	0.089	100.00	9	RACINE	579	0.087	100.00	9	FORTWORTH
953	0.090	100.00	3	DURHAN MS	571	0.088	100.00	9	BRIDGEPRT
432	0.090	100.00	11	ASHEVILLE	952	0.089	50.00	3	MANTEO
471	0.090	100.00	10	ASHEBORO	938	0.089	100.00	4	TACOMA
651	0.091	100.00	8	TACOMA	559	0.089	100.00	9	JACKSONVL
653	0.091	100.00	8	LOWRY	557	0.089	100.00	9	VICTOR TX
387	0.092	100.00	12	SYRACUSE	983	0.089	100.00	3	MANTEO
816	0.092	100.00	5	TALLAHASE	648	0.090	100.00	8	TACOMA
1131	0.092	100.00	0	BRIDGEPRT	918	0.091	100.00	4	DURHAN MS
817	0.093	100.00	5	BRIDGEPRT	921	0.091	100.00	4	ASHEBORO
537	0.093	100.00	9	MANTEO	919	0.091	100.00	4	ASHEBORO
482	0.094	100.00	10	ASHEBORO	606	0.092	100.00	8	TACOMA
574	0.094	100.00	9	TACOMA	624	0.092	100.00	8	PROVIDNCE
543	0.094	100.00	9	TACOMA	818	0.092	100.00	5	AWENDA
481	0.094	100.00	10	TACOMA	604	0.093	100.00	8	TACOMA
469	0.094	100.00	10	LOWRY	720	0.093	100.00	7	MANTEO
605	0.094	100.00	8	BINGHAMTO	819	0.093	100.00	5	WCSRC
1121	0.095	100.00	0	RACINE	719	0.093	100.00	7	MANTEO
479	0.095	100.00	10	CARLOS AV	603	0.093	100.00	8	TACOMA
478	0.095	100.00	10	AWENDA	483	0.094	100.00	10	CARLOS AV
652	0.095	100.00	8	TACOMA	607	0.094	100.00	8	TACOMA
1122	0.095	100.00	0	RACINE	576	0.094	100.00	9	TACOMA
842	0.095	100.00	5	JACKSONVL	494	0.095	100.00	10	TALLAHASE
723	0.095	100.00	7	AWENDA	1123	0.095	100.00	0	RACINE
841	0.095	100.00	5	VICTOR TX	726	0.095	100.00	7	LOWRY
724	0.095	100.00	7	AWENDA	638	0.095	100.00	8	TACOMA
722	0.095	100.00	7	GOLDENPND	637	0.095	100.00	8	GOLDENPND
640	0.096	100.00	8	AWENDA	495	0.095	100.00	10	TACOMA
974	0.096	100.00	3	MANTEO	725	0.095	100.00	7	LOWRY
790	0.096	100.00	6	TACOMA	493	0.096	100.00	10	MILL MOUN
1097	0.096	100.00	1	TACOMA	937	0.096	100.00	4	MANTEO
932	0.096	100.00	4	MANTEO	1098	0.096	100.00	1	TACOMA
294	0.096	100.00	15	TACOMA	1009	0.096	100.00	2	TACOMA
1020	0.097	100.00	2	WHEELING	792	0.096	100.00	6	TACOMA
1095	0.097	100.00	1	TACOMA	1010	0.096	100.00	2	TACOMA
1117	0.097	100.00	0	WCSRC	1118	0.097	100.00	0	WCSRC
956	0.097	100.00	3	SIoux FAL	1021	0.097	100.00	2	WHEELING
957	0.097	100.00	3	SIoux FAL	545	0.097	100.00	9	RACINE
491	0.097	100.00	10	WCSRC	958	0.097	100.00	3	SIoux FAL
729	0.098	100.00	7	MILL MOUN	1096	0.097	100.00	1	TACOMA
791	0.098	100.00	6	CARLOS AV	550	0.098	100.00	9	ASHEBORO

SB#	MK	%Known	Age	Location	SB#	MK	%Known	Age	Location
549	0.098	100.00	9	TALLAHASE	551	0.098	100.00	9	ASHEBORO
490	0.099	100.00	10	BLOOMINGT	730	0.098	100.00	7	ASHEBORO
742	0.099	100.00	7	BLOOMINGT	690	0.099	100.00	7	SYRACUSE
687	0.099	100.00	7	TACOMA	692	0.099	100.00	7	FOSSILRIM
740	0.099	100.00	7	BLOOMINGT	743	0.099	100.00	7	WCSRC
688	0.099	100.00	7	TACOMA	744	0.099	100.00	7	WCSRC
632	0.099	100.00	8	MANTEO	646	0.100	100.00	8	GREENBAY
689	0.099	100.00	7	SPRINGFIE	516	0.100	100.00	9	CHATT NAT
511	0.100	100.00	9	FRESNO	515	0.100	100.00	9	TACOMA
645	0.100	100.00	8	GREENBAY	647	0.100	100.00	8	TALLAHASE
513	0.100	100.00	9	FOSSILRIM	793	0.102	100.00	6	BREVARD
514	0.100	100.00	9	FOSSILRIM	629	0.102	100.00	8	ALEXANDRI
406	0.101	100.00	11	ALEXANDRI	1130	0.104	100.00	0	BREVARD
477	0.102	100.00	10	BREVARD	1127	0.104	100.00	0	BRIDGEPRT
492	0.103	100.00	10	TACOMA	1128	0.104	100.00	0	BREVARD
621	0.104	100.00	8	CARLOS AV	622	0.104	100.00	8	KNOXVILLE
1125	0.104	100.00	0	BREVARD	1129	0.104	100.00	0	BREVARD
1124	0.104	100.00	0	BREVARD	1126	0.104	100.00	0	BRIDGEPRT
619	0.104	100.00	8	CARLOS AV	535	0.106	100.00	9	CARLOS AV
620	0.104	100.00	8	CARLOS AV	533	0.106	100.00	9	CARLOS AV
436	0.106	100.00	11	TACOMA	705	0.106	100.00	7	TACOMA
702	0.106	100.00	7	TACOMA	534	0.106	100.00	9	CARLOS AV
701	0.106	100.00	7	TACOMA	704	0.106	100.00	7	TACOMA
521	0.110	100.00	9	AWENDA	703	0.106	100.00	7	TACOMA
520	0.110	100.00	9	MANTEO	522	0.110	100.00	9	SPRINGFIE
924	0.082	100.00	4	TACOMA	364	0.077	100.00	12	TACOMA

Descendent Mean Kinship = 0.0961

Appendix E

Definitions

Management Terms

SSP Complete Analysis and Breeding and Transfer Plan - The document resulting from a Master planning Session and a 30 day comment period of a draft plan providing breeding and transfer recommendations for a Species Survival Plan. Full Participation is required of all AZA member institutions. MOPs are required of all AZA non-member institutions.

Full Participation - AZA policy stating that AZA member institutions proclaim a level of participation (Breeding, Holding, Support) to each SSP in which the institution participates, and that AZA member institutions implement the SSP Complete Analysis and Breeding Plan once the institution has been given the opportunity to respond to a draft plan. Further explanation can be found in the AZA Resource Center at www.aza.org.

MOP, Memorandum of Participation - A document to be secured by each SSP Coordinator from every AZA non-member institution participating in the SSP. This document ensures that the SSP Complete Analysis and Breeding Plan will be implemented by the non-member institution. Further explanation can be found in the AZA Resource Center at www.aza.org.

PMP Complete Analysis and Breeding and Transfer Recommendations - The document resulting from a Master planning Session and a 30 day comment period of a draft plan providing breeding and transfer recommendations for a Population Management Plan. Full Participation is NOT required of all AZA member institutions; participation is voluntary. MOPs are NOT required of all AZA non-member institutions. Recommendations involving non-AZA institutions do not imply endorsement of the non-member by the AZA or the SPMAG Advisor.

Demographic Terms

Age Distribution -- A two-way classification showing the numbers or percentages of individuals in various age and sex classes.

Population Growth Rate (Lambda, λ) -- The proportional change in population size from one year to the next. Lambda can be based on life-table calculations (the expected lambda) or from observed changes in population size from year to year. A lambda of 1.11 means a 11% per year increase; lambda of .97 means a 3% decline in size per year.

P_x, Age-Specific Survival – The probability that an individual of age x survives one time period; is conditional on an individual being alive at the beginning of the time period. Alternatively, the proportion of individuals which survive from the beginning of one age class to the next.

Q_x, Mortality – Probability that an individual of age x dies during time period. $Q_x = 1 - P_x$
The proportion of individuals that die during an age class. It is calculated from the number of animals that die during an age class divided by the number of animals that were alive at the beginning of the age class (i.e. "at risk").

l_x, Age-Specific Survivorship – The probability that a new individual (eg., age 0) is alive at the *beginning* of age x . Alternatively, the proportion of individuals which survive from birth to the beginning of a specific age class.

M_x, Fecundity – The average number of same-sexed young born to animals in that age class. Because SPARKS is typically using relatively small sample sizes, SPARKS calculates M_x as 1/2 the average number of young born to animals in that age class. This provides a somewhat less "noisy" estimate of M_x, though it does not allow for unusual sex ratios. The fecundity rates provide information on the age of first, last, and maximum reproduction.

V_x, Reproductive Value – The expected number of offspring produced this year and in future years by an animal of age x .

E_x, Life Expectancy – Average years of further life for an animal in age class x .

Risk (Q_x or M_x) – The number of individuals that have lived during an age class. The number at risk is used to calculate M_x and Q_x by dividing the number of births and deaths that occurred during an age class by the number of animals at risk of dying and reproducing during that age class.

Genetic Terms

Current Gene Diversity (GD) -- The proportional gene diversity (as a proportion of the source population) is the probability that two alleles from the same locus sampled at random from the population will be identical by descent. Gene diversity is calculated from allele frequencies, and is the heterozygosity expected in progeny produced by random mating, and if the population were in Hardy-Weinberg equilibrium.

Effective Population Size (Inbreeding N_e) -- The size of a randomly mating population of constant size with equal sex ratio and a Poisson distribution of family sizes that would (a) result in the same mean rate of inbreeding as that observed in the population, or (b) would result in the same rate of random change in gene frequencies (genetic drift) as observed in the population. These two definitions are identical only if the population is demographically stable (because the rate of inbreeding depends on the distribution of alleles in the parental generation, whereas the rate of gene frequency drift is measured in the current generation).

Founder -- An individual obtained from a source population (often the wild) that has no known relationship to any individuals in the derived population (except for its own descendants).

Founder Genome Equivalents (FGE) -- The number wild-caught individuals (founders) that would produce the same amount of gene diversity as does the population under study. The gene diversity of a population is $1 - 1 / (2 * FGE)$.

Founder Genome Surviving -- The sum of allelic retentions of the individual founders (i.e., the product of the mean allelic retention and the number of founders).

Inbreeding Coefficient (F) -- Probability that the two alleles at a genetic locus are identical by descent from an ancestor common to both parents. The mean inbreeding coefficient of a population will be the proportional decrease in observed heterozygosity relative to the expected heterozygosity of the founder population.

Mean Generation Time (T) -- The average time elapsing from reproduction in one generation to the time the next generation reproduces. Also, the average age at which a female (or male) produces offspring. It is not the age of first reproduction. Males and females often have different generation times.

Mean Kinship (MK) -- The mean kinship coefficient between an animal and all animals (including itself) in the living, captive-born population. The mean kinship of a population is equal to the proportional loss of gene diversity of the descendant (captive-born) population relative to the founders and is also the mean inbreeding coefficient of progeny produced by random mating. Mean kinship is also the reciprocal of two times the founder genome equivalents: $MK = 1 / (2 * FGE)$. $MK = 1 - GD$.

Percent Known -- Percent of an animal's genome that is traceable to known Founders. Thus, if an animal has an UNK sire, the % Known = 50. If it has an UNK grandparent, % Known = 75.

KV, Kinship Value -- The weighted mean kinship of an animal, with the weights being the reproductive values of each of the kin. The mean kinship value of a population predicts the loss of gene diversity expected in the subsequent generation if all animals were to mate randomly and all were to produce the numbers of offspring expected for animals of their age.

GU, Genome Uniqueness -- Probability that an allele sampled at random from an individual is not present, identical by descent, in any other living individual in the population. GU-all is the genome uniqueness relative to the entire population. GU-Desc is the genome uniqueness relative to the living non-founder, descendants.

Prob Lost -- Probability that a random allele from the individual will be lost from the population in the next generation, because neither this individual nor any of its relatives pass on the allele to an offspring. Assumes that each individual will produce a number of future offspring equal to its reproductive value, V_x .

FOKE, First Order Kin Equivalents -- The number of first-order kin (siblings or offspring) that would contain the number of copies of an individual's alleles (identical by descent) as are present in the captive-born population. Thus an offspring or sib contributes 1 to FOKE; each grand-offspring contributes 1/2 to FOKE; each cousin contributes 1/4 to FOKE. $FOKE = 4 * N * MK$, in which N is the number of living animals in the captive population.

Representation -- Number of copies of a founder's genome that are present in the living descendants. Each offspring contributes 0.5 to Representation, each grand-offspring contributes 0.25, etc.

Allele Retention -- The probability that a gene present in a founder individual exists in the living, descendant population.