FELID CONSERVATION ASSESSMENT AND MANAGEMENT PLAN AND GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

August 1995

Report from the workshops held
8-12 March 1994
and
22-23 August 1994

Byers, O., D. Wildt and U. Seal, editors

Collaborative Workshops

Sao Paulo Zoo

San Diego Zoo

IUCN/SSC Cat Specialist Group

AZA Felid Taxon Advisory Group

IUCN/SSC Conservation Breeding Specialist Group

SPECIES SURVIVAL COMMISSION

A contribution of the IUCN/SSC Conservation Breeding Specialist Group, Sao Paulo Zoo, San Diego Zoo, IUCN/SSC Cat Specialist Group, and the AZA Felid Taxon Advisory Group.

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1 September 1995

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AND
GLOBAL CAPTIVE ACTION RECOMMENDATIONS

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SECTION 1

FELID CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

FELID CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Introduction:

Reduction and fragmentation of wildlife populations and habitat are occurring at a rapid and accelerating rate. For an increasing number of taxa, the results are small and isolated populations at risk of extinction. A rapidly expanding human population, now estimated at 5.25 billion, is expected to increase to 8 billion by the year 2025. This expansion and concomitant utilization of resources has momentum that cannot be stopped, the result being a decreased capacity for all other species to simultaneously exist on the planet.

As wildlife populations diminish in their natural habitat, wildlife managers realize that management strategies must be adopted that will reduce the risk of extinction. These strategies will be global in nature and will include habitat preservation, intensified information gathering and, in some cases, scientifically-managed captive populations that can interact genetically and demographically with wild populations.

Successful preservation of wild species and ecosystems necessitates developing and implementing active management programs by people and governments living within the range area of the species in question. The recommendations contained here are based on conservation need only; adjustments for political and other constraints are the responsibility of regional governmental agencies charged with preserving the flora and fauna within their respective countries.

Conservation Assessment and Management Plans (CAMPs):

Within the Species Survival Commission (SSC) of IUCN-The World Conservation Union, the primary goal of the Conservation Breeding Specialist Group (CBSG) is to contribute to developing holistic and viable conservation strategies and management action plans. Toward this goal, CBSG is collaborating with agencies and other 'specialist groups' worldwide to develop scientifically-based processes on both a global and regional basis with the goal of facilitating an integrated approach to species management for conservation. One of these tools is a Conservation Assessment and Management Plan (CAMP).

CAMPs provide strategic guidance for applying intensive management techniques that are increasingly required for survival and recovery of threatened taxa. CAMPs also are one means of testing the applicability of the Mace-Lande criteria for threat as well as the scope of its applicability. Additionally, CAMPs produce ongoing summaries of current data for groups of taxa, providing a mechanism for recording and tracking species status.

In addition to managing natural habitat, conservation programs leading to viable populations of threatened species may sometimes need a captive component. In general, captive populations and programs can serve several roles in holistic conservation: 1) as genetic and demographic reservoirs that can reinforce wild populations, whether by revitalizing populations that are languishing in natural habitats or by re-establishing by translocating populations that have become depleted or extinct; 2) by providing scientific resources for information and technology that can be used to protect and manage wild populations; and 3) as living ambassadors that can educate the public as well as generate funds for *in situ* conservation.

It is proposed that, when conservation can be enhanced, captive and wild populations should (and can be) intensively and interactively managed with interchanges of animals occurring as needed and as feasible. Captive populations should be a support, not a substitute for wild populations. There may be problems with interchange between captive and wild populations with respect to disease, logistics and financial limitations. In the face of the immense extinction crisis facing many taxa, these issues must be addressed and resolved immediately.

The CAMP process. The CAMP process assembles expertise on wild and captive management for the taxonomic group under review in an intensive and interactive workshop format. The purpose of this Felid CAMP reassessment was to assist in further developing a global conservation strategy for all felids, and to continue to test the applicability of the Mace-Lande criteria. On 18-20 March, 1994, 54 individuals met in Front Royal, Virginia to review, refine and develop further conservation strategies for the Felidae family. A South American regional CAMP review was conducted 22-23 August, 1994, in Sao Paulo, Brazil. Forty-six participants from 7 countries evaluated the forty-seven distinct South American felid taxa.

At each workshop, participants worked together to: 1) determine best estimates of the status of the species/subspecies in the family Felidae; 2) reevaluate each taxon according to Mace-Lande categories of threat; and 3) identify areas of action and information needed for conservation and management purposes. Assessments and recommendations of the working group were circulated to the entire group prior to final consensus, as represented in this document. Summary recommendations concerning research management, assignment of all taxa to threatened status and captive breeding were supported by the workshop participants.

CAMP workshop goals. The goals of the Felid CAMP workshop were:

1. To review the population status and demographic trends for Felidae, to reevaluate the applicability of the Mace-Lande criteria for threat and to discuss management options for various felid taxa.

2. To provide recommendations for *in situ* and *ex situ* management, research and information-gathering for all felid taxa, including: recommendations for PHVA workshops; more intensive management in the wild; taxonomic research, survey, monitoring, investigation of limiting factors, taxonomy or other specific research.

3. Produce an updated CAMP document for Felidae, presenting the recommendations from the workshop for distribution to and review by workshop participants and all parties world-wide interested in felid conservation.

Assignment to Mace-Lande categories of threat. All Felidae taxa were evaluated on a taxon-by-taxon basis in terms of current and projected status in the wild to assign priorities for conservation action or information-gathering. Workshop participants applied the criteria proposed for the redefinition of the IUCN Red Data Categories proposed by Mace and Lande (G. M. Mace and R. Lande, 1991, Conservation Biology 5:2, pp. 148-157). The Mace-Lande

scheme assesses threat in terms of a likelihood of extinction within a specified time period (Table 1). The system defines three categories for threatened taxa:

Critical	50% probability of extinction within 5 years or two generations, whichever is longer.
Endangered	20% probability of extinction within 20 years or 10 generations, whichever is longer.
Vulnerable	10% probability of extinction within 100 years.

Definitions of these criteria are based on population viability theory. To assist in making recommendations, participants in the workshops were encouraged to be as quantitative or numerate as possible for two reasons: 1) CAMPs ultimately must establish numerical objectives for viable population sizes and distributions; 2) numbers provide for more objectivity, less ambiguity, more comparability, better communication and, hence, cooperation. During the workshops, there were many attempts to estimate if the total population of each taxon was greater or less than the numerical thresholds for the three Mace-Lande categories of threat. In many cases, current population estimates for felid taxa were unavailable or available for species/subspecies within a limited part of their distribution. In all cases, conservative numerical estimates were used. When population numbers were estimated, these estimates represented first-attempt, order-of-magnitude educated guesses that were hypotheses for falsification. As such, the workshop participants emphasized that these estimates should not be authoritative for any other purpose than was intended by this process.

Table 1. MACE-LANDE CATEGORIES AND CRITERIA FOR THREAT

POPULATION TRAIT	CRITICAL	ENDANGERED	VULNERABLE
Probability of extinction	50% within 5 years or 2 generations, whichever is longer	20% within 20 years or 10 generations, whichever is longer	10% within 100 years
	OR	OR	OR
	Any 2 of the following criteria:	Any 2 of following criteria or any 1 CRITICAL criterion	Any 2 of following criteria or any 1 ENDANGERED criterion
Effective population N_e	$N_e < 50$	$N_e < 500$	$N_e < 2,000$
Total population N	$N < 250$	$N < 2,500$	$N < 10,000$
Subpopulations	≤ 2 with $N_e > 25$, $N > 125$ with immigration < 1/generation	≤ 5 with $N_e > 100$, $N > 500$ or ≤ 2 with $N_e > 250$, $N > 1,250$ with immigration < 1/gen.	≤ 5 with $N_e > 500$, $N > 2,500$ or ≤ 2 with $N_e > 1,000$, $N > 5,000$ with immigration < 1/gen.
Population Decline	$> 20\%$/yr. for last 2 yrs. or $> 50\%$ in last generation	$> 5\%$/yr. for last 5 years or $> 10\%$/gen. for last 2 years	$> 1\%$/yr. for last 10 years
Catastrophe: rate and effect	$> 50\%$ decline per 5-10 yrs. or 2-4 generations; subpops. highly correlated	$> 20\%$ decline/5-10 yrs, 2-4 gen $> 50\%$ decline/10-20 yrs, 5-10 gen with subpops. highly correlated	$> 10\%$ decline/5-10 yrs. $> 20\%$ decline/10-20 yrs. or $> 50\%$ decline/50 yrs. with subpops. correlated
OR			
Habitat Change	resulting in above pop. effects	resulting in above pop. effects	resulting in above pop. effects
OR			
Commercial exploitation or Interaction/introduced taxa	resulting in above pop. effects	resulting in above pop. effects	resulting in above pop. effects

In assessing threat according to Mace-Lande criteria, workshop participants also used information on the status and interaction of habitat and other characteristics (Table 1). Information about population trends, fragmentation, range and stochastic environmental events, real and potential, also were considered.

Numerical information alone was insufficient for assignment to one of the Mace-Lande categories of threat. For example, based solely on numbers, a taxon might be assigned to the 'Vulnerable' or 'Secure' category. Knowledge of the current and predicted threats or fragmentation of remaining natural habitat, however, may lead to assignment to a higher category of threat.

Mace-Lande categories of threat for the 292 taxa (including regional populations of certain taxa) examined during this CAMP exercise are presented in Table 2. Table 11 shows Mace-Lande categorization and recommendations for all felid taxa.

Table 2. Threatened Felid Taxa - Mace-Lande Categories of Threat

MACE-LANDE CATEGORY	NUMBER OF TAXA	PERCENT OF TOTAL
Critical	32	11.0
Endangered	78	26.7
Vulnerable	104	35.6
Secure	59	20.2
Unknown	10	3.4
Extinct	9	3.1
TOTAL	292	100

Table 3. Regional Distribution of Threatened Felid Taxa*

	REGION						
MACE-LANDE	Africa	South & Central America	Asia	India	Middle East	Europe	North America
Critical	3	5	8	2	5	4	5
Endangered	10	32	21	5	6	0	7
Vulnerable	24	41	16	3	4	4	18
Secure	21	1	10	3	3	2	15
TOTAL	58	79	55	13	18	10	45

*Some taxa are found in more than one region.

Recommendations for intensive management and research actions. For all taxa, recommendations were generated for the kinds of intensive action necessary, both in terms of management and research, that were believed necessary and high priority for effective conservation. These recommendations (summarized in Table 4) were: 1) Population and Habitat Viability Assessment (PHVA) workshops; 2) wild management and research; and 3) captive programs. PHVA workshops provide a means of assembling available, detailed biological information on the respective taxa, evaluating threats to habitat, developing management scenarios with immediate and 100-year time-scales and formulating specific adaptive management plans with the aid of simulation models. In some cases, workshop participants determined that the current level of information for a taxon was inadequate for conducting a PHVA; in those cases, recommendations were listed as PHVA Pending.

Workshop participants attempted to develop an integrated approach to management and research actions needed for conserving felid taxa. In all cases, an attempt was made to make management and research recommendations based on the various levels of threat impinging on the taxa. For the purposes of the CAMP process, threats were defined as 'immediate or predicted events that are or may cause significant population declines'.

With only partial understanding of the underlying causes for decline in some taxa, it was sometimes difficult to clearly define specific management actions needed for conservation. Therefore, 'research management' must become a component of conservation and recovery activities. Research management can be defined as a management program that includes strong feedback between management activities and an evaluation of the efficacy of the management, as well as response of the Felidae taxa to that activity. Seven basic categories of research management activities were identified: survey (e.g., search and find); monitoring; translocation; taxonomic research or clarification; management of limiting factors; limiting factors research; and life history research. The frequent need for survey information to evaluate population status, especially for those taxa listed as Critical, emphasizes the need to quickly implement intensive survey methods.

Table 4. Research Management Recommendations for Felids

MACE-LANDE	PHVA	PHVA Pend	Survey	Monitr	Life History Rsrch	Limiting Factors Rsrch	Limiting Factors Mgmt	Habitat Mgmt	Taxon Rsrch	Husb	Trnsloc
Critical	19	5	26	10	3	1	1	6	25	5	1
Endangered	33	2	46	30	14	1	0	12	43	34	5
Vulnerable	25	3	82	48	20	19	1	19	94	19	20
Secure	6	0	17	2	0	1	0	1	58	3	1
TOTAL	83	10	171	90	37	22	2	38	220	61	27

Captive Program Recommendations. For some felid taxa, it was determined that a captive component is necessary to contribute to maintaining long-term viable populations. As more and more felid species are threatened with population declines, cooperative recovery programs (including both zoos and the private sector) may provide a major avenue for survival. This cooperation must include support for field research, habitat conservation and public education.

When *ex situ* management was recommended, at these workshops the 'level' of a captive program also was prepared, reflecting status, prospects in the wild and taxonomic distinctiveness. The captive levels used during the Felid CAMP are defined below:

Level 1 (1) -A captive population is recommended as a component of a conservation program that has a tentative goal of developing and managing a population sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). The program should be further defined with a species management plan encompassing the wild and captive populations and implemented immediately with available stock in captivity. If the current stock is insufficient to meet program goals, a species management plan should be developed to specify the need for additional founder stock. If no stock is present in captivity then the program should be developed collaboratively with appropriate wildlife agencies, Species Survival Commission (SSC), Specialist Groups and cooperating institutions.

Level 2 (2) - Similar to the above except a species/subspecies management plan includes periodic reinforcement of the captive population with new genetic material from the wild. The levels and amount of genetic exchange needed should be defined in terms of the program goals, a population model and species management plan. It is anticipated that periodic supplementation with new genetic material will allow management of a smaller captive population. The time period for implementation of a Level 2 program will depend on the CAMP recommendations.

Level 3 (3) - A captive program is not currently recommended as a demographic or genetic contribution to conservation of the species/subspecies, but is recommended for education, research or husbandry.

Other captive recommendations include:

No (N) - A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies. Taxa already held in captivity may be included in this category. In this case, species/subspecies should be evaluated either for management toward a decrease in numbers or for complete elimination from captive programs as part of a strategy to accommodate as many species/subspecies as possible of higher conservation priority as identified in the CAMP or in an SSC Action Plan.

Pending (P) - A decision on a captive program will depend upon further data either from a PHVA, a survey or existing identified sources to be queried.

During the CAMP workshops, all felid taxa were reevaluated relative to their current need for captive propagation. Recommendations were based upon immediate need for conservation (population size, Mace-Lande status, population trend, type of captive propagation program), need for or suitability as a surrogate species, current captive populations and determination of 'difficulty' (as stated above). Based on all the above considerations, in addition to threats, trends and Mace-Lande assessment, recommendations for captive programs were made. These recommendations, by category of threat, are presented in Table 5.

Table 5. Captive Program Recommendations for Felids by Mace-Lande Threat Category

MACE-LANDE	Level 1	Level 2	Level 3	Pending	No
Critical	16	1	0	2	10
Endangered	28	17	0	2	9
Vulnerable	4	44	1	18	21
Secure	0	10	0	1	28
TOTAL	48	72	1	23	68

Recommendations for levels of programs and information concerning the current and proposed regional captive populations of various Felidae species/subspecies are presented in the following tables.

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SECTION 2

CAMP SPREADSHEET CATEGORY DEFINITIONS

FELID
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP)
SPREADSHEET CATEGORIES

The Conservation Assessment and Management Plan (CAMP) spreadsheet is a working document that provides information that can be used to assess the degree of threat and recommend conservation action. The first part of the spreadsheet summarizes information on the status of the wild and captive populations of each taxon. It contains taxonomic, distributional, and demographic information useful in determining which taxa are under greatest threat of extinction. This information can be used to identify priorities for intensive management action for taxa.

TAXON
SCIENTIFIC NAME: Scientific names of extant taxa: genus, species, subspecies.

WILD POPULATION
RANGE: Geographical area where a species and its subspecies occur.

EST #: Estimated numbers of individuals in the wild. If specific numbers are unavailable, estimate the general range of the population size.

DQ (Data Quality):

1 = Recent (<8 years) census or population monitoring
2 = Recent (<8 years) general field study
3 = Recent (<8 years) anecdotal field sightings
4 = Indirect information (trade numbers, habitat availability).
5 = Indirect speculative information

Any combination of above = different data quality in parts of range.

SUB-POP: Number of populations within the taxonomic unit. Ideally, the number of populations is described in terms of boundary conditions as delineated by Mace-Lande and indicates the degree of fragmentation. If a population is fragmented, an "F" may be entered.

TRND: Indicates whether the natural trend of the species/subspecies/population is currently (over the past 3 generations) increasing (I), decreasing (D), or stable (S). Note that trends should NOT reflect supplementation of wild populations. A + or - may be indicated to indicate a rapid or slow rate of change, respectively.

AREA: A quantification of a species' geographic distribution.

AAA: > 5,000 sq km; geographic island
AA: < 5,000 sq km; geographic island

AA-1: < 1,000 sq km; geographic island
AA-2: < 100 sq km; geographic island
AA-3: < 10 sq km; geographic island
A: < 5,000 sq km
B: 5,000 - 9,999 sq km
C: 10,000 - 49,999 sq km
D: 50,000 - 99,999 sq km
E: > 100,000 sq km
F: 500,000 - 999,999 sq km
G: > 1,000,000 sq km

M/L STS: Status according to Mace/Lande criteria.
C = Critical
E = Endangered
V = Vulnerable
S = Secure
EXT = Extinct

Threats: Immediate or predicted events that are or may cause significant population declines.
A = Aircraft
C = Climate
D = Disease
F = Fishing
G = Genetic problems
H = Hunting
Hf = Hunting for food
Hp = Human persecution
Ht = Hunting for trophies
Hyb = Hybridization
I = Human interference or disturbance
Ic = Interspecific competition
Ice = Interspecific competition from exotics
Il = Interspecific competition with domestic livestock
L = Loss of habitat
La = Loss of habitat because of exotic animals
Lf = Loss of habitat because of fragmentation
Lp = Loss of habitat because of exotic plants
M = Marine perturbations, including ENSO and other shifts
P = Predation
Pe = Predation by exotics
Ps= Pesticides
Pl= Powerlines

Po= Poisoning
Pu= Pollution
S = Catastrophic events
Sd: drought
Sf: fire
Sh: hurricane
St: tsunami
Sv: volcano
T = Trade for the live animal market or furs
W = War

PHVA: Is a Population and Habitat Viability Assessment Workshop recommended? Yes or No? NOTE**A detailed model of a species' biology is frequently not needed to make sound management decisions.

Yes or No/Pending: pending further data from surveys or other research

Research/Management:

It should be noted that there is (or should be) a clear relationship between threats and subsequent outlined research/management actions. The "Research/Management" column provides an integrated view of actions to be taken, based on the listed threats. Research management can be defined as a management program which includes a strong feedback between management activities and an evaluation of the efficacy of the management, as well as response of the bird species to that activity. The categories within the column are as follows:

T	=	Taxonomic and morphological genetic studies
Tl	=	Translocations
S	=	Survey - search and find
M	=	Monitoring - to determine population information
H	=	Husbandry research
Hm	=	Habitat management - management actions primarily intended to protect and/or enhance the species' habitat (e.g., forest management)
Lm	=	Limiting factor management - "research management" activities on known or suspected limiting factors. Management projects have a research component that provide scientifically defensible results.
Lr	=	Limiting factor research - research projects aimed at determining limiting factors. Results from this work may provide management recommendations and future research needs
Lh	=	Life history studies
O	=	Other - to be defined specifically on individual taxon data sheets

CAPTIVE PROGRAMS

NUM: Number of individuals in captivity (according to ISIS and other information, when available).

DIFF: This column represents the level of difficulty in maintaining the species in captive conditions.

1 = **Least difficult.** Techniques are in place for capture, maintenance, and propagation of similar taxa in captivity, which ostensibly could be applied to the taxon.

2 = **Moderate difficulty.** Techniques are only partially in place for capture, maintenance, and propagation of similar taxa in captivity, and many captive techniques still need refinement.

3 = **Very difficult.** Techniques are not in place for capture, maintenance, and propagation of similar taxa in captivity, and captive techniques still need to be developed.

REC: Level of Captive Program.

Level 1 (1) - A captive population is recommended as a component of a conservation program. This program has a tentative goal of developing and managing a population sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). The program should be further defined with a species management plan encompassing the wild and captive populations and implemented immediately with available stock in captivity. If the current stock is insufficient to meet program goals, a species management plan should be developed to specify the need for additional founder stock. If no stock is present in captivity then the program should be developed collaboratively with appropriate wildlife agencies, SSC Specialist Groups, and cooperating institutions.

Level 2 (2) - Similar to the above except a species/subspecies management plan would include periodic reinforcement of captive population with new genetic material from the wild. The levels and amount of genetic exchange needed should be defined in terms of the program goals, a population model, and species management plan. It is anticipated that periodic supplementation with new genetic material will allow management of a smaller captive population. The time period for implementation of a Level 2 program will depend on recommendations made at the CAMP workshop.

Level 3 (3) - A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies but is recommended

for education, research, or husbandry.

Other captive recommendations include:

No (N) - A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies. Taxa already held in captivity may be included in this category. In this case species/subspecies shod be evaluated either for management toward a decrease in numbers or for complete elimination from captive programs as part of a strategy to accommodate as many species/subspecies as possible of higher conservation priority as identified in the CAMP or in SSC Action Plans.

Pending (P) - A decision on a captive program will depend upon further data either from a PHVA, a survey, or existing identified sources to be queried.

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SECTION 3

SPREADSHEET AND TAXON DATA SHEETS FOR CRITICAL FELID TAXA

Table 6.

CRITICAL FELID TAXA

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
4	Felis (Pardofelis)	badia Bay cat	Borneo	<50??	5	YES	D		C	L	P	T,S	0		P
49	Felis	concolor coryi	S. Florida	30 - 50	1	YES	D	AA-1	C	Pu,I,G,D	Com-pleted	M,H	11	2	LEV 1
76	Felis (Mayailurus)	iriomotensis Iriomoto cat	Iriomote Island, Japan	100	1	NO	D		C	D, Hyb	YES	T,S, M	?	2?	LEV 1
77	Felis (Oreailurus)	jacobita Andean Mtn Cat	N. Chile, Peru, Bolivia, Argentina	<1,000	3,4	YES	?	?	C/E	H,I	P	T,S,M, Lh	0	3	P/ LEV 1
95	Felis	pardalis albescens	Texas, NE Mexico	<100	2	NO	D	?	C	H,I,L	YES	T,M, Hm	0	2	LEV1
131	Felis	silvestris grampia (Scth Wildcat)	Scotland	<1,000	4	NO	I	?	C/V ?	Hyb	YES	T	3	1	LEV 2
153	Felis	tigrina oncilla	Costa Rica to N.Panama	200-300?	2	YES	D	AA	C	I,L,Lf,	YES	T,H,Lh	0	1	LEV 1
189	Lynx	caracal michaelis	Turkmenia	<500	5	YES	D		C	L	YES	S,T	10	1	N
192	Lynx	caracal schmitzi	Arabia to C. India	<500?	5	YES	D		C	L,H	YES	S,T	3	1	N
201	Lynx	pardinus (spanish lynx)	Spain, Portugal	<1,000	2	YES	D	?	C	?	YES	S	3		LEV 1
215	Neofelis	nebulosa Clouded leopard	S.E. Asia	<10,000	4	YES	D		C/E	L,H	YES	H,S,M,T	140	3	LEV 1
216	Neofelis	nebulosa brachyurus	Taiwan				D		C						

217	Neofelis	nebulosa diardi (Subspecies sep unclear)	Sumatra, Borneo				D		C				1		
225	Acinonyx	jubatus venaticus	Iran, Turkmenia	<100	4	NO	D		C		YES	S,T	0		N
233	Panthera	leo persica	Gir Forest, India	<300	1	NO	S		C	D,I,H,II,L	NO	H,O	65?	1	LEV 1
236	Panthera	onca arizonensis	N.W. Mexico	<500	4	YES	D	C	C	H,I,L Lf	YES	Hm,T,S	<10	1	LEV 1
239	Panthera	onca hernandesii	Mexico	<500	4	YES	D	C	C	H,I,L Lf	YES	T,S,Hm	40	1	LEV 1
240c	Panthera	onca onca	Brazil	~10,000 (onca+ palustris)		YES	D		C	G,Ht,I, L,Lf,Po, T(skin)	P	T,TI,S, M,Lh,H, Hm,Lm, Lr			
242	Panthera	onca peruvianus	Ecuador, Peru	<500	4	YES	D	C	C	H,I,L Lf	YES	T,S,Hm	<10	1	LEV 1
243	Panthera	onca veraecruscis	E. Mexico	<500	4	YES	D	C	C	H,I,L Lf	YES	T,S,Hm	<10	1	LEV 1
245	Panthera	pardus adersi	Zanzibar	<50	4	NO	D		C	H,L	YES	T,S	0		N
248	Panthera	pardus ciscaucasia	Russia Caucusus	<25	5	YES	D		C	H,L	NO	T,S	0		N
249	Panthera	pardus dathei	S. Iran, S.W. Afganistan	<500	5	YES	D		C	L,H	YES	S,T	0		N
253	Panthera	pardus kotiya	Sri Lanka	<250	3	YES	D		C	L	YES	T,S	40		LEV 1
260	Panthera	pardus nannopardus	Somalia	<100 (poss. ext.)	4	YES	D		C	Po	YES	S	0		N
261	Panthera	pardus nimr	Israel, Jordan, Arabia	<100	3	YES	D		C	D	YES	S,T	0		N
262	Panthera	pardus orientalis	Siberia, N. Korea, Manchuria	<100	3	YES	D		C	H	NO	T,S,M	136	1	LEV 1
263	Panthera	pardus panthera	Morocco	<20	3	NO	D		C	L,H	YES	S	0		N

271	Panthera	pardus tulliana	Turkey, Lebanon, Iraq, Syria	<25	4	YES	D		C	H,L	NO	S,T	0		N
272	Panthera	tigris (no subspecies) Tiger													
273	Panthera	tigris altaica	Siberia	<250	2	YES	D-rpd		C	L,Lf,H	YES	T,S,M	711	1	LEV 1
274	Panthera	tigris amoyensis	S. China	40	3	YES	D		C	L,Lf	YES	T,S,M	52	1	LEV 1
278	Panthera	tigris sumatrae	Sumatra	400-500	2	YES	STBL		C	L,Lf,H	Com-pleted	T,S,M	235	1	LEV 1

***Panthera pardus adersi* (Zanzibar leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Threatened
Distribution: Zanzibar
Population: <50
Data Quality: Indirect information
Field Studies: Unaware of any efforts
Threats: Hunting, Loss of habitat
Concerns/Comments: The estimated global population is fewer than 100 and declining. Taxonomic examination is strongly needed because the subspecies is suspected of being named on the basis of abnormal skins not typical of the population. There is one forest preserve within Zanzibar.
Recommendations:
Research/Management: Survey of wild population status. Blood/tissue samples will be difficult to obtain, so taxonomy issue not likely to be resolved.
Captive Program: None recommended at present time
PHVA: Required to develop a management plan.
Captive Population: 0 individuals

***Panthera pardus nannopardus* (Somalian leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Somalia
Population: <100 (possibly extinct)
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Poisoning
Concerns/Comments: The estimated global population is fewer than 100 individuals and declining. This subspecies is possibly extinct because it was poisoned.
Recommendations:
Research/Management: Survey to address extinction issue. No need to address taxonomy at this time, and it is unlikely that blood/tissue samples can be obtained.
Captive Program: None recommended at the present time.
PHVA: Yes
Captive Population: 0 individuals

***Panthera pardus panthera* (Barbary leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Morocco
Population: <20
Data Quality: Recent anecdotal field sightings
Field Studies: Unaware of specific efforts
Threats: Loss of habitat and hunting
Concerns/Comments: The estimated global population is fewer than 20 individuals and declining. This subspecies is nearly extinct. At last report, a few animals were found in one gorge living on monkeys and goats.
Recommendations:

Research/Management: Survey of wild population. Only one questionable blood/tissue sample is available to resolve taxonomy issue, and it is unlikely that others will be obtained.

Captive Program: None recommended.

PHVA: Yes
Captive Population: 0 individuals

***Felis badia* (Bay cat)**

Status: Mace-Lande: Critical
CITES: Appendix II
USFWS: Endangered
Distribution: Restricted to the island of Borneo
Population: <50??
Data Quality: No information available
Field Studies: Unaware of specific efforts
Threats: Loss of habitat
Concerns/Comments: *F. badia* is known from only 3 museum specimens; one specimen is in the London museum and 2 are in the Sarawak Museum. The bay cat may be a subspecies of *F. temmincki*. For this reason, and because of its rarity, it is impossible to accurately estimate the wild population (which could be as few as 50 individuals). There simply are no descriptions of live animals. Deforestation appears to be a principal threat. Recent publication in Oryx by Sunquist and Sunquist concerning location of skins. DNA from one animal is currently being sequenced and analyzed in Dr. S.J. O'Brien's laboratory.
Recommendations:

Research/Management: Analysis of taxonomic status is a high priority. The use of the materials from the 3 skins for DNA analysis may allow the needed clarification. Survey of the wild population including every reserve is a high priority.

Captive Program: Pending taxonomic clarification.

PHVA: Required, pending taxonomic clarification.

Captive Population: 0 individuals

***Felis iriomotensis* (Iriomote cat)**

Status: Mace-Lande: Critical
CITES: Appendix II
USFWS: Endangered
Distribution: Iriomote Island, Japan
Population: 100
Data Quality: Recent census or population monitoring
Field Studies: 1980's radio-tracking studies and survey
Threats: disease, hybridization
Concerns/Comments: Species uniqueness has been questioned and is being addressed genetically in Dr. Steve O'Brien's laboratory. Some view this taxon as a form of *bengalensis*; others (Leyhausen) disagree. If it is another leopard cat, conservation need decreases but ease of propagation may increase. The estimated global population probably is scientists have provided updated information on this species. The Iriomote Island habitat consists mostly of broadleafed evergreen forests with dense mangrove along the estuaries. The cats are found in all habitats on the island. They are solitary, each occupying a range of 2 to 3 square km that overlaps with the ranges of other cats. This appears to be a relatively "ancient" species possessing some morphologic traits linking it to the golden cats (*aurata* and *temmincks)*, marbled cat (*F. marmorata*) and perhaps leopard cat (*F. bengalensis*). There is a concern that this species is in peril due to: 1) small population; 2) accidental trapping; 3) competition with domestic cats; and 4) potential for disease transference from domestic cats. This small population probably also is vulnerable to inbreeding and natural disasters.
Recommendation:

Research/Management: Survey and continued monitoring of wild population status and taxonomy to determine subspecies uniqueness and level of inbreeding/hybridization. It may be useful to consider an eradication program for feral domestic cats.

Captive Program: Level 1: establish a viable captive population within 3 years capable of maintaining 90% genetic diversity for 100 years and/or translocate some of the existing population to another island to establish a second population.

PHVA: Required.
Captive Population: A few of unknown number are in captivity

***Neofelis nebulosa: brachyruus, diardi, macrosceloides, nebulosa* (Clouded leopard spp.)**

Status: Mace-Lande: for *brachyruus* and *diardi*, Critical; for *macrosceloides* and *nebulosa*, Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Countries of the Himalayas, southern China and Taiwan to peninsular Malaysia, Sumatra and the island of Borneo
Population: <10,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Loss of habitat and hunting
Concerns/Comments: The estimated global population is less than 10,000 individuals. This species rarely is seen in the wild, but is strongly tied to dense tropical evergreen forests. Nothing is known about the social system. Four subspecies have been identified (but one of these from Taiwan probably is extinct) and are in need of taxonomic clarification. The species is highly susceptible to deforestation and land conversion and poaching for fur and food. With respect to captive propagation, this species has significant husbandry/management problems. There is a high incidence of sexual incompatibility between unfamiliar adults which might be partly resolved by the use of assisted reproductive technology. Recently, a single litter of cubs has been produced in North America using laparoscopic artificial insemination.
Recommendations:
Research/Management: Survey and monitoring of wild population status (including determining if the Taiwan subspecies is extinct), taxonomy to determine subspecies uniqueness and husbandry to enhance captive propagation. Because of the prevalent problem of sexual incompatibility, this species is an excellent candidate for artificial breeding.
Captive Program: Level 1: an SSP is in place and is working towards establishing a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years.
PHVA: Yes
Captive Population: 141 total individuals

Lynx caracal: michaelis, schmnitzi (Asian caracal spp.)

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Unlisted

Distribution: Asian caracals are found through parts of the Middle East, Saudi Arabia, the former U.S.S.R., Pakistan and northwest and central India. For *michaelis*, Turkmenia; for *schmnitzi*, Arabia and central India.
Population: For *michaelis*, <500; for *schmnitzi*, <500.
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: For *michaelis*, loss of habitat; for *schmnitzi*, loss of habitat and hunting.
Concerns/Comments: The estimated global population is unknown. This species is "protected" in the former U.S.S.R. because it is threatened by habitat destruction and persecution. There is a need for improved in situ management.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness.

Captive Program: None recommended at present time.

PHVA: Required to develop in situ management program.

Captive Population: 3 for *schmnitzi*, there are 10 *michaelis* in ISIS institutions. Adelaide Zoo in Adelaide South Australia currently holds 1.2 provenanced animals Adelaide to breed on request; all requests welcome.

Acinonyx jubatus venaticus (Cheetah)

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered

Distribution: Iran and the former U.S.S.R.
Population: <100
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: None
Concerns/Comments: The status of this Iranian population needs to be addressed. There are recent reports from Iranian specialists, and sign was seen by Colin Groves in 1990.
Recommendations:

Research/Management: Survey of wild population status and taxonomic research.

Captive Program: None recommended at present time.

PHVA: Yes

Captive Population: none

***Panthera pardus* (Leopard; see individual subspecies taxon data sheets)**

Status: Mace-Lande:
CITES:
USFWS:
Distribution: Africa, Asia
Population:
Data Quality:
Field Studies:
Threats:
Concerns/Comments: The African populations of *Panthera pardus* do not have the genetic uniqueness to warrent the status of separtate subspecies (Sriyanie Miththapala, Ph.D. thesis, National Cancer Institute, c/o Steven O'Brien). In light of this information, it may be appropriate for the individual *Panthera pardus* taxa to be considered as populations rather than disticnt subspecies.
Recommendations:
Research/Management:
Captive Program:
PHVA:
Captive Population:

***Panthera pardus ciscaucasia* (Caucasian leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Russia Caucusus
Population: <25
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Habitat loss and hunting
Concerns/Comments: The estimated global population is fewer than 25 individuals and declining. This subspecies has poor in situ management, and protection regulations are poorly enforced.
Recommendations:
Research/Management: Survey of wild population status. Blood/tissue samples will be difficult to obtain, so taxonomy issue not likely to be resolved.
Captive Program: None recommended at the present time.
PHVA: Not required
Captive Population: 0 individuals

***Panthera pardus dathei* (Iran, West Afghanistan leopard)**
Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Southern Iran, western Afghanistan
Population: <500
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Loss of habitat and hunting
Concerns/Comments: The estimated global population is fewer than 500 and declining. This species inhabits dry, mountain areas of eastern Iran and western Afghanistan. There is no in situ management and the natural prey base is declining due to loss of habitat. The coat color of this subspecies is slightly greenish.
Recommendations:
Research/Management: Survey of wild populations. Attempts have been made to obtain blood/tissue samples to address taxonomy issue, but without success. Therefore, it is unlikely that taxonomy can be resolved easily.
Captive Program: None recommended at present time.
PHVA: Required to develop a management plan.
Captive Population: 0 individuals

***Panthera pardus kotiya* (Sri Lankan leopard)**
Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Sri Lanka
Population: <250
Data Quality: Recent anecdotal field sighting
Field Studies: Unaware of specific efforts
Threats: Loss of habitat
Concerns/Comments: The estimated global population is fewer than 300 individuals and declining. Habitat loss is the primary problem for this subspecies which is breeding well in captivity. Habitat is rapidly being lost and the status of the National Parks is threatened.
Recommendations:
Research/Management: Survey of wild populations. Blood/tissue samples have been collected and presently are being analyzed to address taxonomy issue.
Captive Program: Level 1: establish a cooperative breeding program with Sri Lanka to maintain 90% heterozygosity over 100 years within 5 to 7 years by importing animals (or genetic materials [sperm/embryos]) from the wild. An international studbook already in place.
PHVA: Required to develop a management program.
Captive Population: 40 individuals

***Panthera pardus nimr* (Israel, Arabian leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Israel, Jordan, Arabia
Population: <100
Data Quality: Recent sighting of poached animals
Field Studies: Unaware of specific efforts
Threats: Disease
Concerns/Comments: The estimated global population is fewer than 100 individuals and declining. This subspecies has a light, sandy coat color which blends well with the environment.
Recommendations:
Research/Management: Survey of wild population. No blood/tissue samples have been obtained to resolve taxonomy issue, however, it may be possible to obtain these materials.
Captive Program: None recommended at the present time.
PHVA: Required.
Captive Population: 6 individuals, wild caught and captive born, in Arabian peninsula

***Panthera pardus orientalis* (Amur leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: North Korea, Manchuria, Siberia
Population: <100
Data Quality: Recent anecdotal field sighting
Field Studies: Ongoing in the former U.S.S.R.
Threats: Hunting
Concerns/Comments: The estimated global population is fewer than 100 individuals and declining. Managers of many of the captive animals are unsure of the genetic purity of specific animals. An international studbook currently exists for this subspecies, and the numbers in captivity are increasing.
Recommendations:

Research/Management: Continue survey and monitoring of wild population status and taxonomy to determine subspecies uniqueness and confirm purity of individuals now in captivity. Blood/tissue samples are available for genetic analysis of some captive animals. The U.S. National Zoological Park and the National Cancer Institute are discussing the possibility of a cooperative study with zoos in the former U.S.S.R. to resolve purity issue of extant population.

Captive Program: Level 1: continue a cooperative breeding program with the former U.S.S.R. to maintain 90% heterozygosity over 100 year. Depending upon survey data, import a few animals (or genetic materials [sperm/embryos]) from the wild population.

PHVA: Not required.
Captive Population: 136 individuals

***Panthera pardus tulliana* (Anatolian leopard)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Turkey, Syria, Iraq, Lebanon
Population: <25
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting and loss of habitat
Concerns/Comments: The estimated global population is fewer than 50 individuals and declining. This subspecies essentially is extinct in the wild but remains legally hunted in Turkey.
Recommendations:
Research/Management: Survey of wild population. No blood/tissue samples are available, and it is unlikely that these materials will come available to resolve taxonomy issue.
Captive Program: None recommended.
PHVA: Not required.
Captive Population: 0 individuals

***Panthera leo persica* (Asian lion)**
Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Gir Forest, India
Population: <300
Data Quality: Recent census or population monitoring
Field Studies: Some in situ monitoring of population is ongoing; 1992 study by the National Cancer Institute, National Zoological Park and Brookfield Zoo (genetics and semen collection)
Threats: Major threats to this taxon include: potential disease, hunting, and human interference, loss of human support due to increased human attacks by lions, habitat loss by intentionally set (by villagers) or accidental forest fires, and competition of domestic livestock with wild herbivores for grazing which affects lion prey base.
Concerns/Comments: The 1990 census places the estimated Asian lion population at 284 individuals. The entire wild population is located within the Gir Forest Sanctuary of India, a 1412 sq. km. reserve. Although game species within the park appear abundant, the density of the lion population continues to cause migration of the lions outside the sanctuary boundaries. In 1992, a North American research team examined lions in the Sakkarbaug Zoo and the Gir Forest Sanctuary. The Sakkarbaug Zoo is the primary holding and distribution facility for all captured and "problem" lions from the forest. Mike Fouraker (Fort Worth Zoo) maintains the international studbook. Genetic and/or reproductive examinations were performed on 37 lions, (18 captive born, 15 captive wild-caught and 4 free-ranging). Indian officials indicated a strong desire to collaborate in future management studies. They especially are interested in developing artificial breeding to allow transferring germ plasm from free-living males into the captive population, some of which is genetically-compromised. This has resulted in confirmed sterility, especially in inbred males. Indian officials also are interested in a PVA. With the exception of 3 individuals, all captive Asiatic lions in North America are not genetically pure.
Recommendations:

Research/Management: Based upon the field study by the North American research team, priority should be placed upon the establishment of an Asian lion germ plasm bank to assist in infusing genetic diversity into the captive population. This material also should be used to enhance propagation efforts of Asian lions outside of India. Hybrid lions (Asian x African cross) presently in captivity should be used to monitor hybrid vigor for research purposes until such time that this space is required for pure Asian lions. Pure Asian lions must have priority is captive space allocation.

Captive Program: Efforts are ongoing to import breeding stock on loan from the Sakkarbaug Zoo to the North American SSP. The latter is initiating permits to import 3 females. ASMP seeks to acquire breeding stock. It is essential to establish a viable self-sustaining captive population be established within 2 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Not required.
Captive Population: 65? individuals

***Panthera tigris sumatrae* (Sumatran tiger)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Island of Sumatra, Indonesia
Population: 400-500
Data Quality: Recent general field study
Field Studies: Study being planned for Way Kambus National Park.
Threats: Loss of habitat, fragmentation, and poaching
Concerns/Comments: The estimated global population is fewer than 1,000 individuals. Loss of habitat, fragmentation and poaching are primary concerns. SSP, EEP, ASMP and PKBSI programs are in place. Recent advances in reproductive technology in tigers (artificial insemination/in vitro fertilization) suggest that these approaches can be used to transfer genetic material and perhaps enhance captive propagation.
Recommendations:

Research/Management: Survey and continue monitoring of wild population status, taxonomy to determine level of genetic diversity and development of artificial breeding and germ plasm storage.

Captive Program: Level 1: complete establishment of a viable, self-sustaining captive population within 3 years capable of maintaining 90% genetic diversity for 100 years. A captive breeding facility has been constructed at Taman Safari Indonesia (1992), an Indonesian Regional studbook established (1992), a PKBSI Indonesian captive management program established (1992), a Regional Genome Resource Bank and DNA library established (1994), and a PKBSI masterplan completed (1995) in Indonesia. In addition, the *Indonesian Sumatran Tiger Conservation Strategy* was published by PHPA in 1994.

PHVA: Took place in Padang, Sumatra in November 1992.
Captive Population: 235 individuals in managed populations (SSP, EEP, PKBSI, ASMP)

***Panthera tigris amoyensis* (South Chinese tiger)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Southern China
Population: 40
Data Quality: Recent anecdotal field sighting
Field Studies: A status survey (Koehler) has been completed recently confirming existence of survivors and reproduction in this subspecies.
Threats: Loss of habitat and fragmentation
Concerns/Comments: There are fewer than 75 individuals world-wide. Loss of habitat and extreme fragmentation are primary concerns. China has the resources to maintain a captive population of this subspecies without participation of other regional zoo programs or an increased financial investment (spaces occupied by other tiger subspecies and their hybrids could be reallocated for breeding amoyensis). However, a cooperative management program could be initiated, if requested by Chinese officials.
Recommendations:

Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies uniqueness and level of inbreeding.

Captive Program: Level 1: establish a viable, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years. A self-sustaining, captive population should be managed and maintained in China.

PHVA: Required.

Captive Population: 52 individuals in Chinese institutions

***Panthera tigris altaica* (Siberian or Amur tiger)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Eastern most Russia near the Sea of Japan, within Sikhote-Alin Mountain Range
Population: <250
Data Quality: Recent general field study
Field Studies: Bragin and Pikunov; Hornocker and Quigley
Threats: Loss of habitat, fragmentation and hunting.
Concerns/Comments: The estimated global wild population is fewer than 400 individuals. Recent evidence suggests that poaching is increasing, habitat is threatened and the current population is fragmented.
Recommendations:

Research/Management: Continuous monitoring of wild population status, taxonomy to identify "pure" subspecies and development of artificial breeding and germ plasm storage.

Captive Program: Monitor the viable, self-sustaining, captive population that is capable of maintaining 90% genetic diversity for 100 years. To generate sufficient captive space for subspecies, generic or hybrid tigers should be culled or otherwise managed to extinction.

PHVA: Required.
Captive Population: 711 individuals

***Lynx pardinus* (Spanish Lynx)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Southwestern Spain and a few areas in Portugal
Population: <1,000
Data Quality: Recent field surveys
Field Studies: Several research projects conducted at Donana Biological Station; field study started in Portugal
Threats: Unknown
Concerns/Comments: The population is highly fragmented and probably numbers fewer than 1,000 individuals. This species lives in wooded areas and remote mountain regions and the sand dunes and scrub of the Coto Donana.
Recommendations:

Research/Management: Establish conservation liaisons with the Biological Station of Donana that recently has initiated a captive breeding project. Survey of wild population status should continue and efforts focused on developing a management/protection program.

Captive Program: Establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years. Donana is beginning a captive breeding program.

PHVA: Required.
Captive Population: 3 (1.2) individuals

***Felis silvestris grampia* (Scottish wildcat)**

Status: Mace-Lande: Critical/Vulnerable?
CITES: Appendix II
USFWS: Unlisted
Distribution: Scotland; widespread north of a line connecting Edinburgh and Glasgow
Population: <1,000
Data Quality: Indirect information
Field Studies: Numerous studies in progress (e.g., University of Edinburgh, Easterbee; see Foreman's bibliography*)
Threats: Hybridization
Concerns/Comments: The estimated global population is fewer than 1,000 individuals. A primary problem is hybridization with domestic cats. Pure specimens are found only in remote areas. The species is legally protected in Great Britain and in situ management programs are ongoing.
Recommendations:

Research/Management: Taxonomy to determine level of hybridization and continued in situ management.

Captive Program: Establish a small nuclear population within 3 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Required.
Captive Population: 3 individuals

***Felis concolor coryi* (Florida panther)**

Status: Mace-Lande: Critical
CITES: Appendix II
USFWS: Endangered
Distribution: Southern Florida
Population: 30 - 50
Data Quality: Recent census or population monitoring
Field Studies: Ongoing (Florida Game and Fresh Water Fish Commission)
Threats: Pollution, human interference, loss of genetic diversity, and FIV
Concerns/Comments: The wild population is declining though it continues to be managed intensively. Extensive studies also on-going on genetics, health and reproductive characteristics including artificial breeding. In 1992, a cub from a western puma (used as a model) for the Florida panther was produced by laparoscopic artificial insemination. Recent studies by O'Brien et al. indicate that this population has experienced some genetic introgression. The Everglades National Park population became extinct in 1991. The population on private lands appears to be stable.
Recommendations:

Research/Management: Continue to monitor the genetic, reproductive, medical and ecological characteristics of the subspecies. Continue emphasis on developing artificial breeding as a method of storing and using germ plasm from free-living males and boosting the developing captive breeding program.

Captive Program: Level 1: essential to establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years, in accordance with guidelines provided by the Florida Game and Fresh Water Fish Commission

PHVA: Completed.
Captive Population: 11

***Felis pardalis albescens* (Ocelot - Texas population)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered
Distribution: Southeastern Texas and northeastern Mexico
Population: <100
Data Quality: Recent and ongoing general field study
Field Studies: Ongoing study in south Texas by Mike Tewes of Texas A&I in progress. This study includes an examination of habitat use, population size migration corridors and translocation
Threats: Hunting, human interference and habitat loss
Concerns/Comments: The estimated population is less than 100 individuals which appear to exist in small, isolated populations. The subspecies is declining because of hunting and human encroachment.
Recommendations:

Research/Management: Continued support of Tewes et al. is a high priority. Issues concerning taxonomy are necessary to determine subspecies uniqueness and level of genetic diversity. Also monitor the wild population.

Captive Program: Recommend immediate initiation of a level 1 captive breeding program in close cooperation with the Texas Parks and Wildlife Department. The political implications of bringing an endangered sub-species into captivity is recognized.

PHVA: Yes
Captive Population: None

***Felis jacobita* (Andean mountain cat)**

Status: Mace-Lande: Critical/Endangered
CITES: Appendix I
USFWS: Endangered

Distribution: Restricted to 4 countries: Argentina, Chile, Bolivia and Peru; above ~4,000 m.

Population: <1,000 (wild speculation; W. Johnson and P. Quillen); according to M.D. Beccaceci, no wild population estimate is known.

Data Quality: Recent anecdotal field sightings and incomplete information

Field Studies: Information on ecology, behavior and natural history is limited and based on only 2 hours of observation. However, there have been some proposed field studies.

Threats: Unknown, recent records of low level hunting and skins recently recovered in Argentina. Human colonization in the valleys of the Andes might block the gene flow between the scattered populations (Scrocchi & Halloy, 1986).

Concerns/Comments: Species uniqueness has been addressed genetically with museum samples in Dr. Steve O'Brien's laboratory. It is impossible to provide even a general estimate of the global population of this species. Chileans were planning to establish a field survey/census program, but funding is questionable..

Recommendations:

Research/Management: Survey and monitoring to determine occurrence/range of wild population followed by taxonomy to determine uniqueness. Also life history research is needed.

Captive Program: Level 1 program may be recommended but is currently pending due to speculation on wild population and the fact that there are none currently in captivity.

PHVA: Pending; not possible until some data are obtained.

Captive Population: None

***Felis guigna: guigna, tigrillo* (kodkod spp.)**

Status: Mace-Lande: Endangered?/Critical
CITES: Appendix II
USFWS: Unlisted

Distribution: Southern Argentina and Southern Chile

Population: 3,000-5,000 (wild speculation; W. Johnson and P. Quillen); wild population much less than this (according to M.D. Beccaceci)

Data Quality: Recent anecdotal field sightings and incomplete information

Field Studies: One project has been proposed in Argentina by Oswaldo Herrara, Bariloche, Argentina.

Threats: Loss of habitat and fragmentation; human interference

Concerns/Comments: So little data are available on this species, that no global population size can be estimated. There are "kodkod" skins housed in the Smithsonian Institution which have the potential to be used for molecular analysis. Other attempts will be made to acquire tissue samples within country. The kodkod apparently is found in coniferous forest, wooded areas and semi-open habitat. This species is considered uncommon in the wild and currently is threatened by serious habitat destruction. Seems to be locally abundant in some areas, Jimenez et al., 1991. However, there seem to be some good populations on the islands off the Chilean coast.

Recommendations:

Research/Management: Survey and monitoring of wild population status and taxonomy to determine species and subspecies uniqueness.

Captive Program: None recommended until systematics and survey data are available, then a level 2 program will be recommended.

PHVA: Not recommended

Captive Population: Possible in South America. Santiago Zoo has had reasonable success in the past in keeping them - there are none currently in captivity.

***Felis tigrina oncilla* (Tiger cat)**

Status: Mace-Lande: Critical
CITES: Appendix I
USFWS: Endangered

Distribution: For the species: Central and South America, from Costa Rica southward to northern Argentina, except Chile and Uruguay.

Population: 200-300

Data Quality: Recent field surveys

Field Studies: Ongoing radio-telemetry field work in Mirador State Park in northeast Brazil (T.G. de Oliveira). According to an assessment of felid populations in Paraguay by Señora Nora Neris de Colman, this species, is not seen and is thought not to occur in this area.

Threats: Habitat loss and fragmentation; susceptible to human interference/disturbance, hunting in Argentina, common pets and predator control for livestock protection.

Concerns/Comments: Formerly described as a forest species, *oncilla* inhabits cloud forest and humid lowland forest as well as scrub savannas. The tigrina, margay and kodkod are extremely difficult to differentiate. This species commonly preys on chicken coups. Hybridization has occurred in European captive populations. There also is concern that hybridization may also be occurring among wild populations. However, Because of the numbers of *tigrina* in captivity, a studbook is needed. *Felis tigrina oncilla* might be taxonomically distinct from other *tigrina* populations. Future studies will clarify this issue.

Recommendations:

Research/Management: Survey and monitoring of wild population status in various countries, taxonomy to determine subspecies uniqueness; life history studies. Husbandry to enhance captive propagation.

Captive Program: Level 1. Establish a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Required in conjunction with a PHVA for the ocelot and margay.

Captive Population: The current North American population for the species contains 22 animals resulting from 7 founders. Of the 7 founders, 3 are still alive and reproducing. An additional 3 founders exist in Europe. There are 80 individuals in the Brazilian zoos and approximately 10 in 2 Brazilian Breeding Centers. In 1993, there were 4 animals born in zoos of which one survived (at Sorocaba Zoo); the other three animals were born at the Itaipu Binacional Breeding Center of which two are still alive (reference: Leusos SZB 1993 and Helio M. Fonles Jr. from Itaipu Binacional). Currently, Sao Paulo Zoo holds 17 *tigrina* with a total of 77 in captivity in Brazil. Three have been captive born during 1994 with two surviving (2 - Sao Paulo, 1 - N. Brazil Zoo).

FELID CONSERVATION ASSESSMENT AND MANAGEMENT PLAN AND GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

SECTION 4

SPREADSHEET AND TAXON DATA SHEETS FOR ENDANGERED FELID TAXA

Table 7. **ENDANGERED FELID TAXA**

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
6	Felis	bengalensis bengalensis	India, SE Asia to Yunan	?		YES	D		E	?	NO	T,S,H	22??		LEV 2
16	Felis	bieti Chinese desert cat	W. Central China	>10,000	5	FRG	?		E?	H,I	NO	T,S	0		LEV 1
18	Felis	bieti chutuchta	S. Mongolia	?			D		E?	T,Hp	NO	S,T	?		N
19	Felis	bieti vellerosa	N.E. Shensi, China	?			D		E?	T,Hp	NO	S,T	?		N
29	Felis (Lynchailurus)	colocolo Pampas cat	Peru, Ecuador & southward	>10,000	3	YES	D	G	E?	L,Lf,I	NO	T,S,H, Lh,M	30	2	LEV 2
30	Felis	colocolo braccata	Central Brazil to N. Argentina	500-1,000	3	YES	D	G	E	Lf,L,I	NO	T,S,H, Lh,M	2	2	LEV 2
31	Felis	colocolo budini	N.W. Argentina						E	Lf,L,I	NO	T,S,H, Lh,M	?	2	LEV 2
32	Felis	colocolo colocolo	C. Chile						E	Lf,L,I		T,S,H, Lh,M	?	2	LEV 2
33	Felis	colocolo crespoi	N.W. Argentina						E	Lf,L,I		T,S,H, Lh,M	?	2	LEV 2
34	Felis	colocolo garleppi (Mtn Pop)	Peru, Chile	<2,000	4	YES	?	F	E	I,Lf,L	YES	T,S,H, Lh,M	<5	2	LEV 1-2
35	Felis	colocolo pajeros	C. Argentina						E						
36	Felis	colocolo thomasi	Ecuador & N. Peru						E						
73	Felis (Oncifelis)	guigna													
74	Felis	guigna guigna Kodkod	S. Chile and Patagonia	3,000-5,000?	3&4	YES	D	C	E?	L,I,Lf	NO	T,S,M, Lh,Hm	0	3	P?/ LEV 2

75	Felis	guigna tigrillo	C. Chile	3,000-5,000?	3&4	YES	D	C	E?	L,I,Lf	NO	T,S,M	?	?	P/ LEV 2
80	Felis	manul manul	Mongolia, W. China, Russia	>10,000	5	YES	D		E/V	H,L,Hp	YES	T,S,H	21		LEV 1
82	Felis	margarita Sand cat	N. Africa to Turkmenia						E/V				22		
83	Felis	margarita harrisonii	Israel, Arabian Pen	<5,000	4	YES	D		E/V?	H	YES	T,S,H	<10		LEV 2
84	Felis	margarita margarita	N. Africa	<5,000	4	YES	D		E/V?	H	YES	T,S,H	0	2	LEV 1
86	Felis	margarita thinobia	Turkestan	<1,000	4	YES	D		E/V?	H	YES	T,S,H	0	2	LEV 1
87	Felis (Pardofelis)	marmorata Marbled cat	Asia						E/V		YES	H,S,M T	3		
88	Felis	marmorata charltoni	Nepal to Burma, S. Tibet	<5,000	5	YES	D		E/V	L,H,I	YES	T,S,H M	4	?	LEV 1
89	Felis	marmorata marmorata	Thailand, Malaysia, Borneo, Sumatra	<5,000	5	YES	D		E/V	L,H,I	YES	T,S,H, M	2		LEV 1
90	Felis	nigripes Black-footed cat	Botswana, Namibia, S.Africa			2			E	L	YES		54	2	N
91	Felis	nigripes nigripes	Namibia, South Africa	?		YES	D		E	L	NO	S,M,T, H	15	2	LEV 1
92	Felis	nigripes thomasi	Eastern Cape Province	?			D		E?	L	NO	T,M,S, H	0	2?	LEV 1
98	Felis	pardalis mitis	C. Brazil & N. Argentina, Paraguay	2,500?	2				E	L,Lf,H,I	YES	T,H,S, M,Lh	30		LEV 2
105	Felis (Prionailurus)	planiceps Flat-headed cat	Malaysia, Thailand Indonesia, Borneo	>10,000	5	YES	D		E/V?	?	NO	T,S,H, M	0	?	LEV 2

106	Felis (Prionailurus)	rubiginosa Rusty-spotted cat	India, Sri Lanka						E/V	L,Lf,H,T	YES				LEV 1
107	Felis	rubiginosa phillipsi	Sri Lanka	1,000	4	YES	D		E	?	P	T,S,H	21		LEV 1
108	Felis	rubiginosa rubiginosa	S. India	>1,000	4	YES	D		E	?	P	T,S,H, M	0		LEV 2
134	Felis	silvestris iraki (includes gordoni)	Iraq, Arabia	?					E/V?	Hyb	NO	T,S,H	?		LEV 1
135	Felis	silvestris jordansi	Mallorca	?					E/V?	Hyb	NO	T,S,H, G	?		LEV 1
140	Felis	silvestris ornata	India to S. Iraq	<500	5	YES	D		E?	H	NO	T,S	6		LEV 1
148	Felis	temmincki dominicanrum	S. & E.China	<5,000	5	YES	D		E	L,I,T	NO	T,S,H M	0		LEV 2
150	Felis	temmincki tristis	S. China, N. Burma,Tibet	<5,000	5	YES	D		E	L,I,T	NO	T,S,M	0		LEV 2
151	Felis (Leopardus)	tigrina Tiger cat	S. America						E						
154	Felis	tigrina pardinoides	Peru, Colombia, Ecuador, W.Venezuela	2,500	3	YES	D	F	E	I,L,Lf	YES	T,S,H	50	1	LEV 1
159	Felis (Leopardus)	wiedii Margay	C&S America	>10,000	2	YES	D	G	E	L,Lf,I	YES	T,S,M, Lh,H	200-300	2	LEV 1
160	Felis	wiedii amazonica	Amazonia						E				2		
161	Felis	wiedii boliviae	Bolivia to Matto Grossa						E				1		
162	Felis	wiedii cooperi	S.E. Texas-N.E. Mexico						E				0		

163	Felis	wiedii glaucula	W. Mexico						E				7		
164	Felis	wiedii nicaraguae	Hondurus to Costa Rica						E						
165	Felis	wiedii oaxacensis	S/C Mexico						E						
166	Felis	wiedii pirrensis	Panama to Bolivia						E						
167	Felis	wiedii salvinia	S.W. Mexico to El Salvador						E						
169	Felis	wiedii weidii	S.E. Brazil, N.E. Argentina, Uruguay	>2,000	3	YES	D	F	E	L,Lf,I	YES	H,Lh, S,M,T	<50	3	LEV 1
170	Felis	wiedii yucatanica	Yucatan and Belize						E						
172	Felis	yagouaroundi cacomitlli	S. Texas, E. Mexico	1000	3&4	YES	D	F	E	I,L,Lf,Hp	NO	T,S,H	1	1	LEV 1
175	Felis	yagouaroundi fossata	S. Mexico, N. Nicaragua	<1,000	3,4	YES	D	B	E	Hp,L, Lf,I		T,S,H	?	2	LEV 2
177	Felis	yagouaroundi panamensis	S. Nicaragua, Ecuador	500-1,000	3,4	YES	D	?	E	Hp,L, Lf,I,W	NO	T,S,H	?	2	LEV 2
178	Felis	yagouaroundi tolteca	W. Mexico to Arizona	?					E	I,L,Lf,Hp	NO	T,S,H	?		LEV 2
218	Neofelis	nebulosa macrosceloides	Nepal to Burma				D		E						
219	Neofelis	nebulosa nebulosa	S. China to Malaysia				D		E						
220	Acinonyx	jubatus Cheetah	Africa	10,000-15,000					E		YES	S,H	316	2	LEV 1
221	Acinonyx	jubatus hecki	W. Africa	<500	4		D		E	None	YES	S,H	0		N

223	Acinonyx	jubatus raineyi	E. Africa	<1,000	3	NO	D		E	None	YES	S,H	0		N
224	Acinonyx	jubatus sommeringii	Nigeria to Somalia	<2,000	3	NO	D		E	None	YES	S,H	0		N
234	Panthera	leo senegalensis	Senegal	<1,000??	4	YES	D		E	L,H	YES	T,S	0		LEV 2
235	Panthera	onca Jaguar	C&S America	>10,000		YES	D		E	Lf,I	YES	T,S	3,000		LEV 1
237	Panthera	onca centralis	C. America Colombia, Ecuador	1000	4	YES	D	F	E	H,I,L Lf	YES	Hm,T, S	100	1	LEV 1
238	Panthera	onca goldmani	Yucatan, Belize, Guatemala	1000	4	YES	D	F	E	H,I,L Lf	YES	Hm,T, S	20	1	LEV 1
240	Panthera	onca onca	Venezuela, Brazil, Guyana	10,000	2	YES	S	G	E	H,I,L Lf		T,S, Hm	~200	1	LEV 1
240a			Bolivia	2,000		YES	I		E	H,Ic,L, Lf,T	YES	M,H, Hm,G, Tl,Lh			
240b			Paraguay	150-200		YES	S		E	H,Ic,L, Lf,T	YES	M,H, Hm,G, Tl,Lh			
240d			Argentina			YES	D		E	H,Ic,L, Lf,T	YES	T,Tl,S, M, H,Hm, Lh,Lr			
241	Panthera	onca palustris	Brazil, Argent., Urug.,Parag., Bolivia	5,000	2	YES	D	G	E	H,I,L Lf	YES	T,S, Hm	50	1	LEV 1
241a			Bolivia	1,000		1	I		E	H,Ic,L, Lf,T	YES	M,H, Hm,G, Tl,Lh			
241b			Paraguay	350		YES	S		E	H,Ic,L, Lf,T	YES	M,H, Hm,G, Tl,Lh			

241d	Panthera	onca palustris	Argentina			YES	D		E	H,Ic,L, Lf,T	YES				
254	Panthera	pardus japonensis	China	<5,000	4	YES	D RPID		E	?	NO	T,S	100		LEV 2
258	Panthera	pardus melas	Java	<500	2	YES	S		E	H,L	NO	T,S	8		N
264	Panthera	pardus pardus	Lower Egypt, Upper Sudan	<1,000			D		E	H,L	YES	S,T	0		N
267	Panthera	pardus saxicolor	N. Iran, Turkmenia, W. Afganistan	<500	5	YES	D		E	H,L	NO	T,S,M	129		EEP ON LEV 1
269	Panthera	pardus sindica	S. Pakistan, E. Afganistan	<500	5	YES	D		E	H,L	NO	T,S,M	1		N
276	Panthera	tigris corbetti	S.E. Asia	<2,000	4	YES	D		E	L,Lf,H	YES	T,M	14	1	LEV 1
279	Panthera	tigris tigris	India	<3,500	4	YES	D		E	I,H	YES	T,M	145	1	LEV 1
281	Panthera	unica	Central Asia	5,000-7,000	1	YES	D		E/V	I,H	YES	T,M	450	1	LEV 1

***Acinonyx jubatus: hecki, raineyi, sommeringii* (Cheetah spp.)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered

Distribution: For *hecki*, Senegal, Mauritania, Algeria and Mali; *sommenngii*, Nigeria to Somalia; for *raineyi* eastern Africa

Population: For *hecki*, <500; for *raineyi,* <1,000; for *sommeringii*, <2,000; for species as a whole, 10,000-15,000

Data Quality: For *hecki*, indirect information; for *raineyi* and *sommeringii*, recent anecdotal field sightings

Field Studies: Survey work throughout Africa by Caro in progress; cub mortality in the Serengeti; ecology in Kenya

Threats: None

Concerns/Comments: There appear to be genetic differences between *A.j. jubatus* and *A.j. raineyi.*

Recommendations:

Research/Management: Continue survey of wild population status and husbandry to enhance captive propagation. There also is a need to continue in situ management efforts.

Captive Program: Continue captive management through the SSP as a single population. SSP breedings should incorporate interbreeding eastern and southern African cheetahs. No captive recommendation is made for individual subspecies.

PHVA: Yes

Captive Population: None of these subspecies in captivity. For *Acinonyx jubatus jubatus*, 316 individuals.

***Panthera leo senegalensis* (West African lion)**

Status: Mace-Lande: Endangered
CITES: Appendix
USFWS: Endangered
Distribution: Senegal
Population: <1,000??
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Loss of habitat and hunting
Concerns/Comments: The estimated wild population is unknown. Considerable efforts need to be directed at determining if this is a legitimate subspecies.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to settle issue of species uniqueness. Depending upon taxonomy findings, develop management in situ and ex situ as part of a combined African lion population. Investigate FIV in wild population and determine spread within population.

Captive Program: Level 2; Depending upon taxonomy, establish a small nuclear population within 5 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild. North American SSP for lions approved in 1994.

PHVA: Yes, depending upon taxonomy, PHVA then will be required to initiate in situ and ex situ management programs.
Captive Population: 0 individuals

***Felis nigripes: nigripes, thomasi* (Black-footed cat spp.)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered

Distribution: Found only in Botswana, Namibia and South Africa. For *nigripes*, southwestern and southern Africa; for *thomasi*, eastern Cape Province

Population: Unknown

Data Quality:

Field Studies: Studied in 1988 carnivore research project.

Threats: Loss of habitat

Concerns/Comments: Black-footed cats are found in dry, open areas where there is some cover in the form of rocks, scrubby bushes or grass. These small cats are solitary, nocturnal and appear to be rather intolerant of human disturbance. Presently, this species is managed in captivity, in part, via an international studbook.

Recommendations:

Research/Management: Survey and monitoring of wild population status, taxonomy to determine subspecies uniqueness and husbandry to enhance captive propagation. Renal disease studies needed for captive populations.

Captive Program: Establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years. This will depend upon numbers in the wild. Maintain an international studbook and establish a regional studbook and an SSP in North America. Manage the 2 subspecies as geographic populations.

PHVA: Not required.

Captive Population: For nigripes, 15 individuals; for generic, 54.

***Panthera pardus melas* (Javan leopard)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Java
Population: <500
Data Quality: Recent general field study
Field Studies: Two recent field studies have reported this species in all National Parks on Java. Mike Griffiths (WWF) has identified 50-60 individuals in Ujong Kulong, and >40 individuals identified in Meri-beteri through camera traps. Charles Santiapillai and Widodo Ramono completed a study of the status of the leopard in Java. Their report states that "although there has never been an island-wide census, it is clear that today leopard populations in Java can be measured in the hundreds whereas in the last century they could have been estimated in the thousands".
Threats: Hunting and habitat loss
Concerns/Comments: The estimated global population is fewer than 500 individuals and declining. The Mace-Lande status was changed from critical to endangered based on: 1) field studies; and 2) security of the National Parks in which they are found.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness and level of genetic diversity. One blood/tissue sample has been collected but more are needed to assist in answering genetic question.

Captive Program: None recommended at the present time.

PHVA: Not required.

Captive Population: 8 individuals; Australasian region interested in increasing their Javan leopard population.

***Felis bengalensis bengalensis* (Leopard cat)**

Status: Mace-Lande: Endangered
CITES: Appendix II
USFWS: Endangered
Distribution: India, Burma, Thailand through Indo-China to Yunan, southern Sichuan
Population: Unknown
Data Quality: ?
Field Studies: Unaware of specific efforts
Threats: Unknown
Concerns/Comments: The estimated global population is about 1 million individuals for all leopard cats. Eleven subspecies of leopard cat have been designated, so a high priority is determining the validity of this partitioning. *F. bengalensis* as a binomial form is safe but *F.b. bengalensis* is endangered. China's Ministry of Forestry is currently conducting a survey on the status of the leopard cat. Drs. Kurt Johnson and Todd Fuller have proposed a detailed study of the exploitation and ecology of the leopard cat in China. The leopard cat seems to thrive in a variety of habitats, from dense tropical forests of Sumatra to the pine forest of Manchuria. Captive propagation has been accomplished, but many individuals appear to have health problems related to an immune deficiency. Efforts should be initiated to begin addressing the problems of fur trade, human encroachment and conversion of habitat for agricultural purposes. However, there is a real need for local wildlife management programs and legal protection. This should be considered as a component of conservation management planning whenever it occurs. Husbandry/captive management might be enhanced by reproductive technology as artificial insemination (fresh and frozen sperm) recently has been successful in this species.
Recommendations:

Research/Management: Survey of wild population status, taxonomy to determine subspecies uniqueness, husbandry to deal with the apparent immune system problem and development of artificial breeding.

Captive Program: Level 2: establish a small nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required.

Captive Population: For bengalensis, 22?; for generic of unknown origin, 32

***Felis manul manul* (Pallas cat)**

Status: Mace-Lande: Endangered/Vulnerable
CITES: Appendix II
USFWS: Unlisted
Distribution: Mongolia, western China, former U.S.S.R.
Population: >10,000
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting/trapping, persecution by humans, habitat destruction (bush clearing).
Concerns/Comments: The estimated global population is about 10,000 individuals. This species lives in deserts, steppes and treeless rocky mountain sides and may be found at elevations as high as 4,000 meters. The F. manul subspecies appears to be in peril due to the fur trade and habitat destruction (brush clearing) and persecution. This species tends to breed poorly in zoos and, when births occur, kittens tend to die at a young age. The subspecies designation needs to be addressed immediately. The Moscow Zoo has been very successful at breeding this species, but recently lost 8 7-month old youngsters to an unknown disease, perhaps feline leukemia. This species is a good exhibit animal and could be a good choice to replace other "good" exhibit species which have been recommended to be eliminated in captivity in North America.
Recommendations:

Research/Management: Survey of wild population status, taxonomy to determine subspecies uniqueness and level of inbreeding and husbandry to address disease susceptibility of neonates and youngsters.

Captive Program: Level 1: establish a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Required.
Captive Population: 21 individuals?

***Felis margarita: harrisonii, margarita, thinobia* (Sand cat spp.)**

Status: Mace-Lande: Endangered/Vulnerable?
CITES: Appendix II
USFWS: Unlisted
Distribution: Northern Africa, Middle East, Transcaucasian region (former U.S.S.R.)
Population: For *harrisonii* and *margarita*, <5,000; for *thinobia*, <1,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting
Concerns/Comments: The estimated global population is fewer than 5,000 each for harrisonfi and margarita and fewer than 1,000 for thinobia. The species inhabits inhospitable arid regions characterized by rolling sand dunes, flat stony plains and rocky deserts. Nothing is known about the social system. An international studbook is in place for schelffieli, harrisonii and scheffeli x harrisonfi.
Recommendations:

Research/Management: Survey and monitoring of wild populations, taxonomy to address subspecies uniqueness and husbandry to enhance captive propagation. Based upon molecular data, there is a need to determine how to manage the existing schzzffeli x harrisonfi hybrid population.

Captive Program: Captive breeding programs are recommended for all subspecies. If wild populations are healthy, more animals (and/or germ plasm) should be taken into captivity. Establish a viable self-sustaining captive population within 3 years capable of maintaining 90% genetic diversity for 100 years for all subspecies.

PHVA: Required.

Captive Population: For *harrisonii*, fewer than 10 individuals; for *margarita*, 0; for *thinobia*, 0

***Felis silvestris ornata* (Indian wildcat)**

Status: Mace-Lande: Endangered?
CITES: Appendix II
USFWS: Unlisted
Distribution: India to S. Iraq
Wild Populations: <500
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting
Concerns/Comments: It is possible that ornata is a distinct species. The subspecies may be threatened by the fur trade.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Depending upon taxonomy, begin to emphasize in situ management.

Captive Program: Level 1: establish a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years. This will depend upon the size of the wild population.

PHVA: Not required.
Captive Population: 6 individuals

***Felis silvestris: gordoni, iraki, jordansi, nesterovi, tristrami* (Middle Eastern wildcat spp.)**

Status: Mace-Lande: Endangered?/Vulnerable?
CITES: Appendix II
USFWS: Unlisted

Distribution: For *gordoni*, United Arab Emirates; for *iraki*, Iraq to northern Arabia; for *jordansi*, Mallorca; for *nesterovi*, Iraq into Iran; for *tristrami*, Syria to southern Arabia

Population: Unknown

Data Quality:

Field Studies: Unaware of specific efforts

Threats: Hybridization

Concerns/Comments: The habitats of these subspecies are quite diverse and are changing rapidly. As a result, some of these subspecies already are extinct in certain historic ranges. In Asia, it can be found in almost any type of habitat from open rocky ground to scrubby brush and agricultural croplands. The primary threat to this species is hybridization with the domestic cat. This species is solitary with both males and females maintaining territories.

Recommendations:

Research/Management: Survey of wild population status, taxonomy to determine subspecies uniqueness, husbandry to enhance captive propagation, and there is a need to develop in situ management strategies. Some genetic research already is in progress (O'Brien).

Captive Program: Establish a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years. This will depend upon the size of the wild population. Until the taxonomy is completed, these 5 subspecies should be managed separately as geographic populations.

PHVA: Not required.

Captive Population: Unknown

***Felis planiceps* (Flat-headed cat)**

Status: Mace-Lande: Endangered\Vulnerable?
CITES: Appendix I
USFWS: Endangered
Distribution: Southern Thailand, peninsular Malaysia, Borneo, Sumatra and Indonesia
Population: >10,000?
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Unknown
Concerns/Comments: The global population is estimated be in excess of 10,000 individuals. Insular populations warrant monitoring, and all populations are in need of local management. This species actually may have benefited from habitat disruption with the development of palm oil plantations resulting in an increase in rodents. Nothing is known about this species' social system. A captive propagation program currently is in the planning stages for this species and *F. marmorata* in Malaysia. Recent communications indicate that this species could possibly be doing well utilizing oil palm habitat (based on increased prey base) in peninsular Malaysia.
Recommendations:

Research/Management: Survey and monitor wild population status, taxonomy to determine level of genetic variation in the insular population and husbandry to enhance captive propagation.

Captive Program: Level 2: establish a small nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild. This program is recommended because of this species' fairly large-sized wild population. It seems logical that the captive breeding program be developed in collaboration with Malaysia.

PHVA: Not required.
Captive Population: None

***Felis marmorata: charltoni, marmorata* (Marbled cat spp.)**

Status: Mace-Lande: Endangered/Vulnerable
CITES: Appendix I
USFWS: Endangered

Distribution: Wide-spread throughout southern Asia; for *F.m. marmorata*, Thailand, peninsular Malaysia, Sumatra, Borneo; for *F.m. charltoni*, Nepal to Burma and southern Tibet

Population: for *F.m. marmorata*, <5,000; for *F.m. charltoni,* <5,000

Data Quality: Very indirect information

Field Studies: Unaware of specific efforts

Threats: Loss of habitat, hunting and human interference

Concerns/Comments: The estimated global population is fewer than 5,000 individuals for each subspecies. This solitary species lives only in forested areas where it is believed to be highly arboreal. Although a high priority is given to this species, there is the need for more information on numbers in the wild. This felid appears to be particularly difficult to census due to (1) its secretive nature and (2) scientists' inability to visually differentiate it from other felid species. A captive propagation program currently is in the planning stages in Malaysia Primary threats to this species include: 1) fur trade; 2) rainforest habitat destruction; and 3) this species intolerance of any human disturbance.

Recommendations:

Research/Management: Survey and monitoring of wild population status, taxonomy to determine species and subspecies uniqueness and husbandry to enhance captive propagation.

Captive Program: Establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years for both subspecies. Provide assistance to Malaysia to develop a captive breeding program based upon the PHVA results.

PHVA: Required.

Captive Population: All geriatric animals. For *F.m. marmorata*, 2 individuals; for *F.m. charltoni*, 4; for generics, 3 individuals

***Felis rubiginosa: phillipsi, rubiginosa* (Rusty-spotted cat spp.)**

Status: Mace-Lande: Endangered
CITES: Appendix II (I - Indian population)
USFWS: Unlisted

Distribution: For *phillipsi*, northern Sri Lanka; for *rubiginosa*, India including the Gir Forest Sanctuary

Population: For *phillipsi*, 1,000; for *rubiginosa*, >1,000

Data Quality: Indirect information

Field Studies: Current ecological study in India (Dangs Forest in Gujarat State).

Threats: Sejal Worah mentioned that people in India hunt and eat this cat although he didn't specifically identify this as a threat.

Concerns/Comments: The estimated global population is about 1,000 individuals for each subspecies. In Sri Lanka, the rusty-spotted cat is found from sea level to 2,100 m in humid forests, low scrub and the arid belts. In India, it lives in moist deciduous forests, scrub forests, grass land and arid scrub. Habitat also includes rocky areas and hill slopes in India. Does not seem to be that rare in India, as most villages reported having seen the cat (T. Oliveira). It is probably solitary, but nothing is known about its social system. This species is particularly sensitive to habitat disruption. The Indian population, *rubiginosa*, is fragmented into many populations. In 1991, rusty spotted cats were discovered and photographed in the Gir forest. Survey and monitoring of wild population status, taxonomy to determine subspecies

Recommendations:

Research/Management: Survey and monitoring of wild population status, taxonomy to determine subspecies uniqueness and husbandry to enhance captive propagation.

Captive Program: Manage *phillipsi* as a geographic species and establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years. Establish a small nuclear population of *rubinginosa* within 3 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Required pending further research.

Captive Population: For *phillipsi*, 21 individuals; for *rubiginosa*, 0.

***Felis temmincki: dominicanorum, tristis* (Temminck's golden cat spp.)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered

Distribution: Throughout southeast Asia from Nepal, east to Burma, China, Thailand, Malaysia and Sumatra. For *dominicanorum*, southern and eastern China; for *tristis*, Tibet, southern China, northern Burma

Population: <5,000 for each subspecies

Data Quality: Very indirect information

Field Studies: Unaware of specific efforts

Threats: Loss of habitat, human interference and fur trade

Concerns/Comments: The estimated global population is fewer than 5,000 individuals for each subspecies. This species lives in deciduous forests, tropical rainforests, and occasionally more open habitats. Nothing is known of its social system. *F.t. tristis* has a spotted pelage (unlike the other 2 subspecies) and warrants systematic attention. This species is intolerant of human disturbance and is very susceptible to persecution from farmers and deforestation. Note that *F.t. temmincki* is classified later in this document as vulnerable. There is a need to clarify if these 2 subspecies should be managed separately or together.

Recommendations:

Research/Management: Survey and monitoring of wild population status, taxonomy to determine subspecies uniqueness and husbandry to enhance captive propagation.

Captive Program: Level 2: establish a small nuclear population within 3 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required.

Captive Population: For *dominicanorum*, 0; for *tristis*, 0

***Panthera pardus japonensis* (Chinese leopard)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: China
Population: <5,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Unknown
Concerns/Comments: The estimated global population is fewer than 10,000. The rapid increase in pelts in recent years has raised suspicions that the wild population is declining rapidly. A studbook and breeding plan may be developed in China. The present captive population began from a small number of founders, and no new founders have been added recently which has resulted in inbreeding.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness and level of genetic variation. An adequate number of blood/tissue samples are available from captive animals, but similar materials are needed from wild-caught stock.

Captive Program: Level 2: Depending upon the number of animals in the wild, establish a cooperative breeding program with the Chinese to maintain a nuclear population within 3 years by importing a few animals (or genetic materials [sperm/embryos]) from the wild. An international studbook already is in place.

PHVA: Not required.
Captive Population: 100 individuals

***Panthera pardus pardus* (Lower Egypt, Upper Sudan leopard)**
Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Lower Egypt, Upper Sudan
Population: <1,000
Data Quality:
Field Studies: Unaware of specific efforts
Threats: Hunting and loss of habitat
Concerns/Comments: The estimated global population is fewer than 1,000 individuals and declining. There currently is no in situ management for this subspecies. There are no animals in captivity (animals presently listed in ISIS result from a clerical error).
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. No blood/tissue samples have been obtained.
Captive Program: None recommended at present time.
PHVA: Yes
Captive Population: 0 individuals

***Panthera pardus saxicolor* (Persian leopard)**
Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Northern Iran, western Afghanistan, Turkmenia
Wild Populations: <500
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting and loss of habitat
Concerns/Comments: The estimated global population is fewer than 500 individuals and declining. In situ management is available in only one country within this range. An EEP program and international program currently are underway for this subspecies.
Recommendations:
Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies uniqueness. An adequate number of blood/tissue samples now are available from captive animals. Perhaps it is possible to obtain samples from wild-caught animals in Turkmenia
Captive Program: Continue the cooperative breeding program under the auspices of the EEP to retain 90% heterozygosity for 100 years. An international studbook already is in place.
PHVA: Not required.
Captive Population: 129 individuals

***Panthera pardus sindica* (Lower Pakistan, East Afghanistan leopard)**
Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Southern Pakistan, eastern Afghanistan
Population: <500
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Habitat loss, hunting
Concerns/Comments: The global population is declining. This subspecies is protected in Pakistan, however, better management of the current legislation is recommended.
Recommendations:
Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies uniqueness.
Captive Program: None recommended.
PHVA: Not required.
Captive Population: 1 individual

***Panthera uncia* (Snow leopard)**
Status: Mace-Lande: Endangered/Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Central Asia including parts of the former U.S.S.R., Mongolia, China, Nepal, Bhutan, India, Pakistan and possibly Afghanistan
Population: 5,000-7,000
Data Quality: Recent census or population monitoring
Field Studies: Ecology in Nepal (R. Jackson, Oli); Status India Wildlife Institute of India (Fox); Tibet (Schaller); Mongolia (Schaller)
Threats: Human interference and hunting
Concerns/Comments: The estimated global population is fewer than 10,000 individuals. The species has been recorded in high rocky areas, alpine meadows, alpine steppe scrub and high altitude forests. Snow leopards generally live above the tree line at elevations of 2,000 to 6,000 m. The snow leopard is solitary, and males and females probably have overlapping ranges. The captive population is stable. An SSP program is in place.
Recommendations:
Research/Management: Continue to monitor the wild population and the amount of genetic diversity within the species and develop artificial breeding and germ plasm storage.
Captive Program: Continue to maintain a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years.
PHVA: Required, dependent upon participation of G.Schaller, R.Jackson and J.Fox.
Captive Population: 450 individuals

***Panthera tigris: corbetti, tigris* (Indochinese, Bengal tiger spp.)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: For *corbetti*, Burma, Thailand, peninsular Malaysia, Indo-China; for *tigris*, India, Nepal, Bangladesh, western Burma, southeastern Tibet
Population: For *corbetti*, <2,000; for *tigris*, <3,500
Data Quality: Indirect information
Field Studies: For *corbetti*, Kuznetzov and Rabinowitz; for *tigris*, Karanth/Sunquist, Schaller and Project Tiger, India and Smithsonian Indian Tiger Project in Nepal
Threats: For *corbetti*, Loss of habitat, fragmentation and hunting; for *tigris*, human interference and hunting
Concerns/Comments: The estimated global wild population is fewer than 2,000 for *corbetti* and fewer than 5,000 for *tigris*. There is only 1 genetically-pure *tigris* in North American zoos, but this subspecies is well-represented in Indian zoos. SSP and EEP programs are in place.
Recommendations:

Research/Management: Continuous monitoring of wild population status, taxonomy to identify "pure" subspecies and development of artificial breeding and germ plasm storage.

Captive Program: Establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years for both *corbetti* and *tigris*. *P.t. corbetti* should be managed and maintained within their historic range. To general sufficient captive space for subspecies, generic tigers or their hybrids should be culled or otherwise managed to extinction.

PHVA: Required.
Captive Population: For *corbetti*, 14; for *tigris*, 145

***Felis bieti: chutuchta, vellerosa* (Chinese desert cat)**

Status: Mace-Lande: Endangered?
CITES: Appendix II
USFWS: Unlisted

Distribution: Restricted to west-central China, specifically from the eastern Tibetan plateau in central Sichuan northward to Inner Mongolia

Population: Unknown

Data Quality:

Field Studies: Unaware of specific efforts

Threats: Fur trade, human persecution

Concerns/Comments: It is very difficult to estimate the global population which may be in excess of 10,000 individuals. A report from 1984 (cited in Broad et al., 1988) mentioned that it was not particularly rare in China. The common name of "desert" is a misnomer as its habitat appears to be more mountainous. Taxonomy of this species needs to be assessed since it possibly is a subspecies of *F. silvestris*. This felid is harvested for the fur trade and is extensively persecuted by farmers. Nothing is known about its social system.

Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine species and subspecies uniqueness.

Captive Program: None is recommended at the present time, but there should be local wildlife management programs for in situ conservation.

PHVA: Not required.

Captive Population: Unknown

***Felis tigrina pardinoides* (Tiger cat)**

Status: Mace-Lande: Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Northwestern South America (Colombia), possibly in Ecuador and Venezuela
Population: 2,500
Data Quality: Recent anecdotal field sightings
Field Studies: Unaware of specific efforts
Threats: Human interference, habitat loss, fragmentation
Concerns/Comments: Based upon morphology, it is possible that this is a distinct species from *F. tigrina* found in eastern South America
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness and husbandry to enhance captive propagation.

Captive Program: Establish a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Required in conjunction with PVA for the ocelot and margay.
Captive Population: 50 individuals

***Panthera onca: arizonensis, centralis, goldmani, hernandesii, peruvianus, veraecruscis* (Jaguar spp.)**

Status: Mace-Lande: *centralis*, *goldmani*, Endangered; *hernandesii*, *peruvianus*, *arizonensis, veraecruscis*, Critical
CITES: Appendix I
USFWS: Endangered
Distribution: *arizonensis, hernandesii, goldmani, veraecruscis*, in Central America; *centralis* C. America into extreme NW S. America; *peruvianus*, Peru.
Population: For *centralis*, 1,000; for *goldmani*, 1,000; for *hernandesii*, <500; for *arizonensis*, <500; for *peruvianus*, <500; for *veraecruscis*, <500.
Data Quality: Incomplete information for all subspecies
Field Studies: Cockscomb area in Belize (Rabinowitz and Nottingham; Watt); Mexico (Aranda).
Threats: Human interference, habitat loss, fragmentation and hunting
Concerns/Comments: Habitat fragmentation may seriously impact migration corridors. Populations in Central America may be more threatened than South American populations (see All Taxa table for regional breakdown) There is considerable retaliation by ranchers on jaguars because of cattle predation. At least 50% of cattle mortality is blamed upon puma/jaguar predation when in fact cattle often starve due to overgrazing of the land. A regional studbook for jaguars was approved this year.
Recommendations:
Research/Management: Survey work should continue and taxonomy to determine Central American subspecies uniqueness, and habitat management.
Captive Program: Establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years.
PHVA: Required.
Captive Population: For *centralis*, 100; for *goldmani*, 20; for *hernandesii*, 40; for *peruvianus*, <10; for *veraecruscis*, <10; for *arizonensis*, <10.

***Panthera onca: onca, palustris* (jaguar spp.)**

Status: Mace-Lande: Critical: *P.o. onca* populations in Brazil's Atlantic forest and Caatinga regions in Argentina; *P.o. palustris* in SW Brazil (Cerrado)
Endangered: both subspecies Paraguay and Bolivia, and *P.o. palustris* in Argentina; *P.o. onca* in Venezuela
Vulnerable: *P.o. onca* populations in the Amazon basin; *P.o. palustris* in the Pantanal (Brazil)
CITES: Appendix I
USFWS: Endangered

Distribution: Throughout South America, but distribution is patchy and fragmented. *P.o. palustris and P.o. onca* are found in Brazil, Argentina, Bolivia, and Paraguay. The entire species is almost certainly extinct in Uruguay. The southernmost populations of this species are probably in Turvo State Park, southern Brazil (ca. 27°S), and locations in Argentina at about the same latitude.

Population: The total population for *P.o. onca* is estimated to be fewer than 10,000 individuals. (Venezuela population is estimated at 2,500 individuals). The total population for *P.o. palustris* is estimated to be fewer than 5,000 individuals. In Paraguay there are about 350 *P.o. palustris* and about 150-200 *P.o. onca (*Chaco). In Bolivia there are about 3000 individuals; *P.o. palustris* no more than 1000 individuals; for *P. o. onca* approximately 2000 (in Chaco). In Brazil it is necessary to examine areas separately for the best assessment of numbers: in the Atlantic forest the estimated number of *P.o. onca* is less than 250 individuals (Critical). In SW Brazil there are thought to be no more than 35 individuals of *P.o. onca* in 175,000 hectares in Brazil (part of the combined 250,000 hectares forming a biological corridor in Brazil and in Argentina). At the Turvo state park there are no more than 3 or 4 individuals in 17,000 hectares. In the Amazon forest in Brazil there are fewer than 10,000 *P.o. onca.* In Argentina there are thought to be approximately 100 individuals (for example, there are 5-7 individuals of *P.o. onca* in Misiones in Parque Iguacu). According to an assessment of felid populations in Paraguay by Señora Nora Neris de Colman, this species is very rarely seen.

Data Quality: Recent general field study

Field Studies: Brazil - Diet and occurrence of jaguar in Atlantic forest in Paraná State (M. R. Pereira Leite/OFPR/IBAMA/ITC); diet and occurrence of jaguar in Atlantic forest of Espirito Santo State (S.L. Mendes MBML); diet and status of jaguar in Buriticupu (Maranhao state - T.G. de Oliveira:UEMA/CVRD); livestock depredation and relative numbers in Paraguaizinho watershed (J. Dalponte/Ecotropica); livestock depredation in Atlantic forest with radiotelemmetry monitoring (J. a Silva/UGMG); diet and occurrence of jaguar in Ema National Park (L. A. Silveira/IBAMA); impact of depredation in livestock in Poconé - Pantanal (R.L.P. Boulhosa/IBAMA/Phoenix Zoo); diet of jaguar in Turvo State Park (DRNR,SAA/RS). Ongoing projects include those at: Pantanal (Schaller, Quigley, and Crawshaw), Iguacu National Park (Crawshaw), Porto Primavera (6 animals with radio-collars - CESP/IBAMA), Carajás (3 males with radio-collars in a study on the feasibility of

translocation (Companhia Vale do Rio Doce/IBAMA), and Pocone, north of the Pantanal of Mato Grosso, a study to assess the impact of livestock predation (IBAMA). In Turvo State Park in the Rio Grande do Sul (Brazil) more than 50 scats have been collected since 1987 for analysis of diet. In Paraná state, in the Area de Protecao Ambiental of Guaraquecaba, including Parque Nacional do Superagui and also in parque Estadual do Marumbi, there are ongoing studies of diet, distribution, footprints, and habitat (principal investigator M.R. Pereira Leite/UFR/IBAMA). In the state of Mato Grosso do Sul, there are radiotelemetry studies on the impact of hydroelectric power. In the state of Pará, there are ongoing studies on jaguar behavior in Carajás, by Fernando Dutra Lima (Companhia Vale do Rio Doce), coordinated by Crawshaw. In Paraguaizinho, in the central part of the Pantanal, there are studies on jaguar depredation (Principal Investigator, Julio Cesar Dalponte; the project is operated through the Relatorio Tecnico a Fundacao Ecotropica). In Paraná in the Parque Nacional do Iguaçu, there are radiotelemetry studies being carried out by Crawshaw, Ronaldo Gonçalves Morato, Rose Lilian Gasparini, and Lucila Manzatti. In Minas Gerais State, in March 1993, a project was begun to assess the number of jaguars in the Rio Doci State Park (most important Atlantic forest region in Minas Gerais; examining feces and tracks). Ecology of carnivores is being studied in southeastern Brazil.

Argentina - There are ongoing studies in Argentina's Parque Nacional de Baritu. In the province of Jujui, Argentina, Pablo Perovic is conducting studies on the impact of jaguar predation.

Paraguay - In Paraguay, there are natural history studies with radiotelemetry planned in the near future. Bolivia - In Bolivia, Sydney Audertou et al. are looking at the classification of mammals in Bolivia including felids. Otto Jordan is also studying the status and distribution of felids in Bolivia.

Threats: For *P.o. onca:*

Argentina - threats include loss of habitat because of introduced species, loss of habitat because of fragmentation, predation, interspecific competition (with puma), hunting for skins, trade, and human interference (tourism).

Paraguay - threats include hunting for skins, human interference, interspecific competition, habitat loss, habitat fragmentation, predation, genetic problems, and hybridization (among subspecies).

Bolivia - threats include hunting for skins, loss of habitat, interspecific competition with livestock, floods (animals are stranded on small "islands" that become inundated with snakes which kill the cats), habitat loss because of fragmentation, trade (for skins).

Brazil - threats include genetic problems (there is concern about inbreeding in some of the isolated populations), hunting for trophies, human interference, loss of habitat (Atlantic forest and Central Brazil - Cerrado), loss of habitat because of fragmentation, trade for skin, and poisoning as a method of protecting livestock.

For *P.o. palustris:*

Argentina - threats include loss of habitat because of introduced species, loss of habitat because of fragmentation, predation, hunting for skins, trade, and human interference.

Paraguay - threats include loss of habitat because of introduced species, loss of habitat because of fragmentation, predation, hunting for skins, trade, and human interference.
Bolivia - threats include loss of habitat because of introduced species, loss of habitat because of fragmentation, predation, hunting for skins, trade, floods, and human interference.
Brazil - threats include genetic problems, hunting for trophies, human interference, loss of habitat, loss of habitat because of fragmentation, trade for skin, and poisoning as a method of protecting livestock.
Concerns/Comments: Preservation of the corridor from Iguacu through Argentina and back to Southern Brazil is critical to the survival of the populations found in Iguacu and Turvo Parks in Brazil. There is considerable retaliation by ranchers on jaguars because of livestock predation. At least 50% of cattle mortality is blamed upon puma/jaguar predation when, in fact, cattle often starve due to overgrazing of land.
Argentina - In Argentina, both subspecies are thought to be decreasing.
Paraguay - In Paraguay, there are 50,000 hectares of protected areas in which 6 jaguars are registered (one is melanistic). Protected areas in Paraguay are: Itaibubi Nacional, Itabó, Limoy, Tatiyupí, Mbaracayi, and Carapa. These areas are united by a polygonal turn of the River Paraná which serves as a biological corridor.
Bolivia - In 1983, the Bolivian government passed laws for strict protection of wildlife including the jaguar, but there are no field studies being carried out. There are several protected areas (Parque Isidoro Cecí and the Parque Nacional Manuripi). In Bolivia, both subspecies are thought to be increasing in number because of protected areas; in Paraguay, both subspecies are thought to be stable.
Brazil - In the Atlantic forest in Paraná state in Brazil, there are two large protected areas (ecological station of Guaraquecaba and Marumbi State Park). In Bahia state in one small fragment of the Atlantic forest (~6,000 hectares) there are two jaguars - one is black. In the northernmost part of Minas Gerais State in Brazil, jaguars are decreasing in number. *P. o. onca* is in the forested parts of South America, and *palustris* is found more on marsh and savannah areas in the central part of South America. Between Sao Paulo State and Mato Grosso, melanistic large (120 kg) jaguars have been recorded (this population has been studied using radiotelemetry). In general, jaguar populations are believed to be declining, except in the Pantanal. In Maranháo, the population is declining sharply because of opportunistic hunting (and because of predator control) as well as fragmentation of habitat.
Recommendations:

Research/Management:

Argentina - taxonomy, translocation, survey, monitoring, husbandry, habitat management, limiting factors management, limiting factors research, life history studies (both subspecies).
Paraguay - taxonomy, monitoring, habitat management, limiting factors research, limiting factors management, life history studies (both subspecies).
Bolivia - monitoring, husbandry, habitat management, genetic studies, translocation, life history studies (both subspecies).
Brazil - taxonomy, translocation, survey, monitoring, habitat management, limiting factors management, limiting factors research, life history studies (both subspecies).

Captive Program: Level 1: Establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Yes (Bolivia, Paraguay, and Argentina); Pending (Brazil; a PHVA is desirable once additional data on numbers are available; a PHVA may be desirably soon on some isolated populations)

Captive Population: 222 individuals of which 212 are generic (per ISIS).

Argentina - in Argentina, a survey of captive jaguar has been carried out by La Plata Zoo. Approximately 35 individuals are held in Argentina - e.g., 2.2 Cordoba; 1.2 Plata; 1.2 Buenos Aires; 3.3 Regional Formosa; 1.0 ECAS; Difficulty of maintaining in captivity = 1 (not difficult); Level 1 captive program recommended.

Paraguay - in Paraguay there are 6 (2.4) in captivity in the Itaipu - Binacional Zoo in Hernandarias; difficulty 1; Level 1 program recommended.

Bolivia - 1.1 *P.o. palustris* and 4.2 *P.o. onca* Zool. Sta. Cruz; 0.2 Oruno; 0.2 La Paz; $\pm$ 10 (5-7 months) as pets; Difficulty of maintaining in captivity = 2 (moderate difficulty); Level 2 captive program recommended.

Brazil - In a survey in which there was a 40% response rate, 200 animals were reported in captivity in Brazil, with the origin known for only 18 animals. In 1990, a law was passed that each zoo in Brazil must have a biologist and a veterinarian and, as a result, record-keeping has improved. Since 1990, the origin of wild-caught animals is being recorded. It is necessary to manage these identified subspecies separately until the specific subspecies designations are appropriately delineated. Difficulty of maintaining in captivity = 1.

***Felis colocolo: braccata, budini, colocolo, crespoi, garleppi, pajeros, thomasi* (Pampas cat spp.)**

Status: Mace-Lande: Endangered?
CITES: Appendix II
USFWS: Unlisted

Distribution: *Felis colocolo ssp.:* Peru, Ecuador and southward (W. Johnson)
Felis colocolo garleppi: Peru, Ecuador and Chile (W. Johnson)
Felis colocolo braccata: Central and western Brazil

Population: *Felis colocolo garleppi*: <2,000 (P. Quillen, W. Johnson)

Data Quality: Indirect information

Field Studies: Study ongoing in Argentina (Rabinovich); 80-day study to determine status of this and other subspecies of cats; census in Paraguay (Brooks). This species is known only from a single specimen at the National History Museum of Paraguay (Neris de Colman).

Threats: The species is vulnerable to habitat loss and fragmentation. It seems strongly affected by human disturbances. Habitat change due to agriculture, effect unknown.

Concerns/Comments: In Argentina, the Pampas cat lives in open grassland, but in other parts of its range it is found in cloud forest and other humid forests. Central, West Brazil occasionally report Pampas cat (*Felis colocolo braccata*). Systematic and biogeographic study by García-Perea (1994) has separated this species into three groups.

Recommendations:

Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies/geographic uniqueness; life history studies and husbandry

Captive Program: Level 2; Establish a nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required; *Felis colocolo garleppi* - yes

Captive Population: <5 for *Felis colocolo garleppi* (P. Quillen, W. Johnson); 30 for *Felis colocolo ssp.* Sao Paulo Zoo, Brazil is holding 2.0 *Felis colocolo braccata.* Cordoba and Mendoza zoos have a couple animals. There are 3 animals in central Chilean zoos. There is one animal in Santa Cruz Zoo, Bolivia (*Felis colocolo garleppi*).

***Felis wiedii: amazonica, boliviae, cooperi, glaucula, nicaraquae, oaxacensis, pirrensis, salvinia, yucatanica* (Margay spp.)**

Status: Mace-Lande: Endangered? (assigned to Vulnerable category by Oliveira in *Neotropical Cats: Ecology and Conservation*, 1994)
CITES: Appendix I
USFWS: Endangered
Distribution: Throughout Central and South America
Population: >10,000
Data Quality:
Field Studies: Belize, 1 animal radio-collared; Mexico (Beltran). Peter Crawshaw captured 1 Margay at Iguacu National Park, 1992?. Ex situ reproductive studies are underway in Itaipu and Federal University of Parana and Sao Paulo Zoo for *F. pardalis, F. wiedii* and *F. tigrina.* According to an assessment of felid populations in Paraguay by Señora Nora Neris de Colman, this species, is not seen and is thought not to occur in this area.
Threats: Highly susceptible to habitat loss and fragmentation, human interference, loss of habitat due to silvaculture and agriculture.
Concerns/Comments: This is an arboreal species strongly associated with primary and secondary forests. In the current North American population, few to no individuals are traceable to wild-caught founders. A logical approach is to develop a captive breeding program for the two subspecies (i) *nicaraguae*, hopefully acquiring founders from Guatemalan zoos, and (ii) *wiedii*, hopefully acquiring founders from the Sao Paulo Zoo. Recommend establishment of studbook.
Recommendations:
Research/Management: Baseline density/abundance survey and monitor population status and taxonomy to determine subspecies/geographic uniqueness, husbandry and life history studies.
Captive Program: Level 1: establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years.
PHVA: Yes, ideally in conjunction with a PHVA for the ocelot and tiger cat.
Captive Population: 200-300; 50 in captivity in Brazil; 10-50 in Central America (Y. Motomoros) and 50 in Mexico (W. Johnson). There are two reports of successful captive breeding in 1993: one cub at Sao Paulo Zoo Park and another one at Itaipu Binational Breeding Centre (Foz do Iguacu-PR.

Felis wiedii wiedii

Status: Mace-Lande: Endangered
CITES:
USFWS:
Distribution: Southern Brazil, Northern Argentina and Uruguay
Population: >2,000
Data Quality: Recent anecdotal field sightings
Field Studies:
Threats: Highly susceptible to habitat loss and fragmentation, human interference, loss of habitat due to silvaculture and agriculture.
Concerns/Comments: This subspecies is at higher risk than the others.
Recommendations:
Research/Management: Monitoring, and life history studies; Survey, husbandry, taxonomy
Captive Program: Level 1
PHVA: Yes, for species
Captive Population: <50, problem with identification of subspecies

Felis pardalis mitis

Status: Mace-Lande: Endangered
CITES:
USFWS:

Distribution: from Central Brazil to Bolivia, Paraguay, Northern Argentina (some fragmented populations).

Population: 2,500?

Data Quality: Recent anecdotal field sightings/general field study

Field Studies: Iguaçu National Park (Crawshaw), Pantanal (Crawshaw and Quigley). An additional study by IBAMA and the Ministry of Agriculture has just been completed in Turvo State Park, Rio Grande do Sul state (Brazil). A study begun in 1993 in the Atlantic forest of Paraná state (Federal University of Paraná/IBAMA) and is still underway. According to an assessment of felid populations in Paraguay by Mrs. Nora Neris de Colman, this species is very rarely seen.

Threats: Loss of habitat, loss of habitat due to fragmentation, human interference, opportunistic hunting.

Concerns/Comments: Quality of information and numbers are more accurate for Southern Brazil because there are more zoos and more pressure on populations in the wild. A captive breeding program should be developed, hopefully acquiring founders from the Sao Paulo Zoo (currently holding 8 animals). The Brazilian Zoo Society (SZB), Ciliary Forest Association (AMC) and IBAMA are coordinating a Management PLan for *Felis pardalis*. Field studies should be designed aiming at the species itself, at the creation of new preservation areas, at the study and recuperation of fragmented and altered (modified) areas for possible reintroduction.

Recommendations:

Research/Management: Monitoring and life history studies. Management recommendations for this subspecies are included in the Regional Management Plan for *F. pardalis*. Survey, Husbandry, Taxonomy

Captive Program: Level 2. Of the South American subspecies of ocelots this is the most threatened. It's status needs to be revisited regularly. Only given Level 2 because there is already a good population available in captivity.

PHVA: Yes

Captive Population: estimated to be 30 individuals. (50% of the 130 animals in captivity in Brazil are wild caught ocelots of known origin; 60% of these are of this subspecies are from southern Brazil and most of the remainder are from Amazonia).

FELID CONSERVATION ASSESSMENT AND MANAGEMENT PLAN AND GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

SECTION 5

SPREADSHEET AND TAXON DATA SHEETS FOR VULNERABLE FELID TAXA

Table 8.

VULNERABLE FELID TAXA

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
1	Felis (Profelis)	aurata African golden cat	West and East Africa						V		NO		1		N
2	Felis (Profelis)	aurata aurata (=cottoni)	Uganda, Congo, Kenya	100,000?	4	YES	D		V	L	NO	T,S,H	2		N
3	Felis	aurata celidogaster	West Africa	50,000?	4	YES	D		V	L	NO	T,S,H	2		N
8	Felis	bengalensis chinensis	China and Formosa	?					V	?	NO	S,T	23		LEV 2
9	Felis	bengalensis euptilura	E. Siberia, Korea	?					V	?	NO	S,T	61		LEV 2
10	Felis	bengalensis horsfieldi	India, Kashmir	?					V	?	NO	S,T			LEV 2
11	Felis	bengalensis javanensis	Java, Bali	?			D		V	?	NO	T,S,H, M	0		LEV 2
12	Felis	bengalensis manchurica Leopard cat	Manchuria, Mongolia	?					V	?	NO	S,T	0		LEV 2
13	Felis	bengalensis minutus	Palawan, Philippines				D		V		NO	T,S,H, M	0		LEV 2
14	Felis	bengalensis sumatranus	Sumatra				D		V		NO	T,S,H, M	0		LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
15	Felis	bengalensis travallani	Kashmir, S. Pakistan	?					V	?	NO	S,T	0		LEV 2
37b	Felis	concolor Puma	Bolivia	?			S		V	L,Lf,P, H,Ic	NO	Lr,S,H, Hm,T, M,Tl	22	1	P
37c			Paraguay	?			S		V	L,Lf,P, H,Ic	NO	Lr,S,H, Hm,T, M,Tl	16	1	P
37d			Argentina	?			S		V	L,Lf,P, H,Ic	NO	Lr,S,H, Hm,T, M,Tl, Lh	?	1	P
38	Felis	concolor acrocodia	Matto Grosso /Brazil	?		YES	?		V/S?	L,Lf,I,H p	NO	T,Lr,S, Hm,M, Tl,Lh	~5	1	P
39	Felis	concolor anthonyi	S. Venezuela	?		YES	?		V/S?	L,Lf,I,H p	NO	T,Lr,S, Hm,M, Tl,Lh	~5	1	P
40	Felis	concolor aruacanus	C. Chile						V/S?	L,Lf,I,H p	NO	T,Lr,S, Hm,M, Tl,Lh	~5	1	P
41	Felis	concolor azteca	S.W. United States, Mexico	>250	4	?	S	AA	V	L,I	NO	T,M	5	1	LEV 2
42	Felis	concolor bangsi	N Colombia Venezuela	?		YES	?		V/S?	L,Lf,I,H p	NO	T,Lr,S, Hm,M, Tl,Lh	~5	1	P
43	Felis	concolor borbensis	C Brazil	?		YES	?		V/S?	L,Lf,I,H p	NO	T,Lr,S, Hm,M, Tl,Lh	~5	1	P
44	Felis	concolorrowni	Arizona, Baja	250	4	NO	?	AA-1	V	I,L	NO	T,M	0	1	LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
45	Felis	concolor cabrera	N Argentina	?		YES	?		V/S?	L,Lf,I,Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~30	1	P
46	Felis	concolor californica	N. Baja, California	5,000 - 10,000??	4	YES	?	F	V/S	I,L	NO	T,M	0	1	LEV 2
47	Felis	concolor capricornensis	S.E. Brazil	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~30	1	P
48	Felis	concolor concolor	E. Venezuala, Guinea Highlands	?		YES			V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	35	1	P
50	Felis	concolor costraricensis	Nicaragua to Panama	500	4	YES	D		V?/ E?	L,I,H Hf	YES	T,S,M	~30	1	N
51	Felis	concolor cougar	Eastern N. America	?	4	YES	E		V	L,I	NO	T,M	0		LEV 2
52	Felis	concolor greeni	E. Brazil	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~10		P
53	Felis	concolor hippolestes	Wyoming, Utah, Montana	1,000 - 2,500??	4	?	S		V	L,I	NO	T,M	14		LEV 2
54	Felis	concolor improcera	S. Baja Peninsula	?	4	?	?	AA-1	V	L,I	NO	T,M	1	1	LEV 2
55	Felis	concolor incarum	Peru	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~5		P
56	Felis	concolor kaibabensis	N. Arizona, S. Utah	>5,000	4	?	S	E	V	L,I	NO	T,M	3		N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
57	Felis	concolor mayensis	S. Mexico, Honduras	1000	4	YES	D		V/E?	L,I,H Lf	YES	T,S,M	50		N
58	Felis	concolor missoulensis	Alberta, Montana	>10,000	4	?	S	G	V/S	L,I	NO	T,M	8		N
59	Felis	concolor oregonensis	Washington Oregon, British Columbia	>10,000	4	?	S	G	V/S	L,I	NO	T,M	6		N
60	Felis	concolor osgoodi	Bolivia	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~5		P
61	Felis	concolor patagonica	S.Chile	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~3		P
62	Felis	concolor pearsoni	S. Argentina	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~10		P
63	Felis	concolor puma	N. Chile Argentina	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~20		P
65	Felis	concolor soderstromii	Colombia, Ecuador	?		YES	?		V/S?	L,Lf,I, Hp	NO	T,Lr,S, Hm,M, Tl,Lh	~10		P
66	Felis	concolor stanleyana	W. Texas New Mexico	300 - 500	4	?	S	G	V	L,I	NO	T,M	11	1	LEV 2
67	Felis	concolor vancouverensis	Vancouver Island, British Columbia	< 500	4	?	S+	AA-1	V	L	NO	T	5	1	N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
68	Felis (Leopardus)	geoffroyi Geoffroy's cat	Bolivia, Chile, Paraguay, Argentina, Uraguay, Brazil	10,000	2	YES	S	G	V	L,Lf, I,H, T(fur)	NO	T,S,M,	~70	2	LEV 2
69	Felis	geoffroyi euxanthis	Bolivia						V						
70	Felis	geoffroyi geoffroyi	S.Argentina Chile						V				2		
71	Felis	geoffroyi paraguae	Uraguay, N.Argentina Paraguay, Brazil						V				6		
72	Felis	geoffroyi salinarum	C.Argentina						V				9		
78	Felis (Otocolobus)	manul Pallas cat	W. Asia						V						
79	Felis	manul ferrugineus	SW Turkestan, Iran, Afganistan	>10,000	5	YES	D		V	L,I,H	NO	T,S,H M	0	2	LEV 2
81	Felis	manul nigripectus Chinese Pallas cat	N.Pakistan, India, Tibet-Nepal	>10,000	5	YES	D		V	L,H,I	NO	T,S,M	2		LEV 2
93	Felis (Leopardus)	pardalis Ocelot	C&S America	>10,000	2	YES	D	G	V	L,I, H,Lf, T(fur)	YES	T,S,H	400-500	2	LEV 2
94	Felis	pardalis aequatorialis	N. Andes		2				V	L,Lf,I,T	YES	S,T			LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
96	Felis	pardalis maripensis	Guiana Highlands		2				V	L,Lf,I,T	YES	T,S			LEV 2
97	Felis	pardalis mearnsi	Nicaragua to Panama		2				V	L,Lf,I,T	YES	T ,S	1		LEV 2
99	Felis	pardalis nelsoni	Coast of C. Mexico		2				V	L,Lf,I,T	YES	T,S			LEV 2
100	Felis	pardalis pardalis	S.E. Mexico-Honduras		2				V	L,Lf,I,T	YES	T,S	1		LEV 2
101	Felis	pardalis pseudopardalis	N.Colombia W Venezuala	?	2	?	?		V	L,Lf,I,T	YES	T,S	3		LEV 2
102	Felis	pardalis pusaeus	S.W. Ecuador, Peru coast		2				V	L,Lf,I,T	YES	T,S	1		LEV 2
103	Felis	pardalis sonorensis	N.W. Mexico, Arizona		2				V	L,Lf,I,T	YES	T,S			LEV 2
104	Felis	pardalis steinbachi	Central Bolivia		2				V	L,Lf,I,T	YES	T,S			LEV 2
123	Felis	silvestris (African Wildcat)	Africa, Europe, Asia	>100,000	4	D			V?	Hyb	NO	T,S	6	1	N
124	Felis	silvestris brockmani	Somalia		4	D			V?	Hyb	NO	T,S			
125	Felis	silvestris cafra	Southern Africa		4	D			V?	Hyb	NO	T,S			
126	Felis	silvestris caucasica	N. Iran, Caucuses						V?	Hyb	NO	T,S	1		LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
127	Felis	silvestris caudata	Turkey to Mongolia						V?	Hyb	NO	T,S			LEV 2
128	Felis	silvestris chutuchta	Gobi						V?	Hyb	NO	T,S			LEV 2
129	Felis	silvestris cretensis	Crete						V?	Hyb	NO	T,S			LEV 2
130	Felis	silvestris foxi	W. Africa		4				V?	Hyb	NO	T,S			
132	Felis	silvestris griselda	Southern Africa						V	Hyb	NO	T,S			
133	Felis	silvestris haussa	West Africa						V	Hyb	NO	T,S			
137	Felis	silvestris matschiei	Turkmenia						V?	Hyb	NO	T,S			LEV 2
138	Felis	silvestris mellandi	Central Africa						V?	Hyb	NO	T			
139	Felis	sivestris ocreata	Ethiopia						V?	Hyb	NO	T			
141	Felis	silvestris reyi	Corsica						V?	Hyb	NO	T,S			LEV 2
142	Felis	silvestris rubida	N.E. Zaire, Congo						V?	Hyb	NO	T,S			LEV 2
143	Felis	silvestris sarda	Sardinia, Atlas Mtns						V?	Hyb	NO	T,S			

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
144	Felis	silvestris silvestris	Europe	500,000		YES	D		V?	Hyb	NO	T,S	33		LEV 2
145	Felis	silvestris ugandae	East Africa						V?	Hyb	NO	T,S	1		
146	Felis	silvestris vellerosa	Mongolia						V?	Hyb	NO	T,S			LEV 2
149	Felis	temmincki temmincki	Nepal to Sumatra	<10,000	5	YES	D		V/E	?	YES	T,S,H M	3		LEV 1
152	Felis	tigrina guttula	E. Brazil to N.Argentina	>10,000	3	YES	D	G	V	I,L, Lf,Hp	YES	T,H,S, M,Lh	~75	1	LEV 1
155	Felis	tigrina tigrina	Amazon basin & N.E. Brazil	>10,000	3	YES	D	G	V	I,L,Lf, Hp	YES	S,M,T, H,Lh	~20	1	LEV 1
157	Felis	viverrinus rizophoreus	Java	<5,000	5	YES	S		V	?	P	T,S,M	0	1	LEV 2
158	Felis	viverrinus viverrinus	S.E. Asia	<10,000	5	YES	D		V	?	P	T,S,M	60	1	LEV 2
168	Felis	wiedii vigens	Guiana Highlands, N. Brazil	>5,000	3	NO	D	G	V	L,Lf,I	YES	H,Lh, S,T,M	<10	3	LEV 3
171	Felis (Herpailurus)	yagouaroundi Jaguarundi	S. US, C&S America	>10,000	3	YES	D	G	V	I,L,Lf, Hp	NO	T,S,H	~200	1	LEV 2 sub pops
174	Felis	yagouaroundi eyra	S. Brazil, N. Argentina	10,000	3,4	YES	S	G	V	I,L,Lf, Hp	NO	T,S,H	?	2	LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
176	Felis	yagouaroundi melantho	Peru	?					V	I,L,Lf, Hp	NO	T,S,H			LEV 2
178	Felis	yagouaroundi tolteca	W. Mexico to Arizona						V				4		
179	Felis	yagouaroundi yagouaroundi	Guiana Highlands	>5,000	3,4	YES	D	G	V	Hp,L, Lf,I	NO	T,S,H	?	?	LEV 2
205	Lynx	rufus escuinapae	N. Mexico	?		?	?		V	?	YES	T	7		N
222	Acinonyx	jubatus jubatus	S. Africa	10,000	3	NO	S		V	H	YES	S,M,H	316		N
227	Panthera	leo azandica	N.E. Congo	?	4		D		V	L,H	YES	S,M,T	6		N
228	Panthera	leo bleyenberghi	Angola, Namibia, W. Zimbabwa	<1,000	4	YES	D		V	L,H	YES	S,M,T	0		N
229	Panthera	leo krugeri	Southern Africa	<10,000	3	YES	D		V	L,H,D	YES	T,S,M	24		LEV 1
232	Panthera	leo nubica	East Africa	10,000	3	YES	D		V	D,H,L	YES	T,S,M	8		LEV 2
241c	Panthera	onca palustris	Brazil	~10,000 (onca+ palustris)		YES	D		V/E	G,Ht,I, L,Lf,Po T(skin)	P	T,Tl,S, M,Hm, Lm,Lr, Lh			
250	Panthera	pardus delacouri	S.E.Asia	<5,000	4	YES	D		V	L,H	NO	T,S	7		N
251	Panthera	pardus fusca	India	10,000	4	YES	D		V	H,L	NO	S	3		N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
256	Panthera	pardus leopardus	West Africa	<10,000	4	YES	D		V	H,L	YES	T,S	1		N
259	Panthera	pardus millardi	Nepal	<2,000	4	YES	D		V	H,L	NO	T,S	0		N
265	Panthera	pardus pernigra	Bhutan	<2,000	4		D		V	H,L	NO	S,T	1		N
266	Panthera	pardus reichenowi	Cameroon	<5,000	4	YES	D		V	H,L	YES	T,S	0		N
268	Panthera	pardus shortridgei	Southern Africa	<100,000	3	YES	D		V	H,L	YES	S,T	Some		N

***Acinonyx jubatus jubatus* (Cheetah)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Southern Africa
Population: 10,000 (Namibian population: 2,500)
Data Quality: Recent census or population monitoring
Field Studies: Considerable longitudinal studies by Caro and associates; recent work in Namibia by Laurie Marker-Kraus; Kruger National Park study. CCF recording sighting by farmers in Namibia.
Threats: Hunting; still being shot as problem animals in Namibia.
Concerns/Comments: There is extensive poaching of animals in certain regions of Africa and unrelenting killing by farmers considering this species a pest. More discussions need to be initiated with locals on the benefits of cheetahs and the concept of sustainable wildlife. The species is well known for its historically poor breeding performance in captivity. However, a very strong SSP program devoted largely to research has developed an impressive database for the species that is likely to improve captive propagation efficiency. Because there appears to be modest genetic differences between *jubatus* and *rainyi*, there may be justification for crossbreeding these subspecies to generate hybrid vigor.
Recommendations:

Research/Management: Survey and monitoring of wild populations, husbandry to enhance captive propagation and development of artificial breeding. For the **Captive Population:** behavioral, assissted reproductive techniques, infectious disease, and nutritional research needed.

Captive Program: Continue to manage under the SSP as a single population with other cheetah subspecies.

PHVA: Yes, in Namibia
Captive Population: 316 individuals; masterplan for North America population completed in November, 1993; there is an ASMP program in place.

***Panthera leo: azandica, nubica, bleyenberghi, krugeri* (African lion spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Endangered
Distribution: Sub-Saharan Africa
Population: for *azandica*, unknown; for *nubica*, 10,000; for *bleyenberghi*, <1,000; for *krugeri*, <10,000
Data Quality: for *azandica*, indirect information; for *nubica*, recent general field study; for *bleyenberghi*, indirect information; for *krugeri*, recent general field study
Field Studies: Extensively studied in the wild, especially in the Serengeti National Park, Namibia and South Africa
Threats: for *azandica* and *bleyenberghi*, loss of habitat and hunting; for *nubica* and *krugeri*, loss of habitat, hunting and disease
Concerns/Comments: Estimated numbers in the wild are fewer than 50,000 individuals and declining rapidly. Good taxonomic studies have not yet been done and are a high priority. There is considerable interest in establishing solid management policies for lion in eastern Africa. There is a need to conduct more in situ surveys of animal numbers by developing improved liaisons with local authorities. The Kenyan Wildlife Service appears interested in exporting eastern African lions. In captivity, there are many lions of unknown origin both in zoos and owned privately.
Recommendations:

Research/Management: Survey and monitoring of wild population status and taxonomy is a high priority to determine subspecies uniqueness.

Captive Program: for *azandica*, none; for *nubica*, level 2; for *bleyenberghi*, none; for *krugeri*, level 1: establish a viable, self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years. A North American regional studbook is maintained by Sue White at Riverbanks Zoo.

PHVA: Yes
Captive Population: for *P.l. azandica,* none; for *nubica*, 8; for *bleyenberghi*, 0; for *krugeri*, 24.

***Felis aurata: aurata, cottoni* (African golden cat spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Unlisted
Distribution: For *aurata*, western Africa; for *cottoni*, Uganda, Congo and Kenya
Population: 100,000?
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Loss of habitat
Concerns/Comments: This species experiences a broad range, but numbers are decreasing due to habitat destruction as it lives primarily in rain forests. It occasionally is hunted for pelts and food and also is persecuted by poultry farmers.
Recommendations:
Research/Management: Survey of wild population status is of high priority as is taxonomy to determine subspecies uniqueness and establishing an in situ management policy.
Captive Program: None
PHVA: Not required.
Captive Population: 2 individuals (presumed non-reproductive)

***Panthera pardus leopardus* (West African leopard)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Western Africa
Population: <10,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting and Loss of habitat
Concerns/Comments: The global population is declining. In situ management for this subspecies is very poor.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness.
Captive Program: None recommended at present time
PHVA: Required to develop a management plan
Captive Population: 1 individual

***Panthera pardus reichenowi* (Cameroon leopard)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Cameroon
Population: <5,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting and Loss of habitat
Concerns/Comments: The estimated global population is fewer than 5,000 individuals and declining. This subspecies is poorly protected.
Recommendations:
Research: Survey of wild population status and taxonomy to determine subspecies uniqueness. Blood/tissue samples have been collected from 2 wild-caught animals to help resolve taxonomy issue.
Captive Program: None recommended at present time.
PHVA: Yes
Captive Population: 0 individuals

***Panthera pardus shortridgei* (South African leopard)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Threatened
Distribution: Southern Africa
Population: <100,000
Data Quality: Recent anecdotal field sightings
Field Studies: Studies in progress including censusing by Peter Norton and demography/ecological behavior by Gus Mills
Threats: Hunting and Loss of habitat
Concerns/Comments: The estimated global population is fewer than 100,000 individuals and is declining. Good in situ management is currently in place. This subspecies serves as a game animal in some range countries.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Adequate blood/tissue samples have been obtained to help resolve taxonomy issue.
Captive Program: None recommended.
PHVA: Yes
Captive Population: some (undetermined number)

***Felis manul: ferrugineuss, nigripectus* (Pallas' cat spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Unlisted
Distribution: For *ferrugineus*, southwest Turkestan, Afghanistan, northern Iran; for *nigripectus*, northern Pakistan, India, Tibet to Nepal
Population: >10,000 for each subspecies
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Loss of habitat, hunting, human interference
Concerns/Comments: The estimated global population is 10,000 individuals for each subspecies. Nothing is known about the social system except that it probably is solitary. Subspecific designation needs to be addressed as ferugineus and nigripectus may be the same subspecies. These subspecies are sensitive to habitat destruction, persecution by farmers and to a lesser extent, fur trade.
Recommendation:

Research/Management: Survey and monitoring of wild population status, taxonomy to determine subspecies uniqueness and development of artificial breeding.

Captive Program: Establish a small nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animal (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required.
Captive Population: For *ferrugineus*, 0 individuals; for *nigripectus*, 2 individuals.

***Felis temmincki temmincki* (Asian golden cat)**

Status: Mace-Lande: Vulnerable/Endangered
CITES: Appendix I
USFWS: Endangered
Distribution: Widespread from Nepal through northeast India and southeast Asia
Population: <10,000
Data Quality: Very indirect information
Field Studies: Unaware of specific efforts
Threats: Unknown
Concerns/Comments: The estimated global population is fewer than 10,000 individuals. This species is threatened by deforestation, farmer persecution and appears intolerant of human disturbance.
Recommendations:

Research/Management: Survey and continue monitoring of wild population status, taxonomy to determine level of genetic variation and husbandry to enhance captive propagation.

Captive Program: Establish a viable self-sustaining, captive population within 3 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Required.
Captive Population: For *F. temmincki temmincki*, 3 individuals; for generics, 23 individuals

***Felis viverrina: rizophoreus, viverrinus* (Fishing cat spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Unlisted

Distribution: Has a discontinuous distribution including in southwest India, Sri Lanka, countries of the southern Himalayas, Bangladesh, Vietnam, Thailand, Burma, and the islands of Sumatra and Java. Specifically, for *rizophoreus*, Java; for *viverrinus*, Sri Lanka through India to Malaysia and Sumatra

Population: for *rizophoreus*, <5,000; for *viverrinus*, <10,000

Data Quality: Very indirect information

Field Studies: Recent work in Nepal with radio-collared animals; also Keoladeo Nat '1 Park, Bharatpur, India, by Bombay Natural History Society

Threats: Unknown

Concerns/Comments: The estimated global population is fewer than 5,000 individuals for *rizophoreus* and fewer than 10,000 for *viverrina*. Despite the species' broad geographical range, its real distribution is quite limited as it is strongly tied to areas of suitable wetland habitat. The captive population may have sufficient founders to development of a self-sustaining captive population. This species appears to reproduce well in captivity and has a high exhibit value.

Recommendations:

Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies uniqueness and level of genetic variation.

Captive Program: Level 2: establish a nuclear population of *viverrinus* within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years. Establish a small nuclear population of *rizophoreus* within 5 to 7 years and maintain a target level of genetic diversity by importing animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Required pending further information.

Captive Population: For *rizophoreus*, 0 individuals; for *viverrinus*, 60 individuals

***Felis bengalensis: borneoensis, javaensis, minutus, sumatranus* (Leopard cat spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Unlisted

Distribution: For *borneoensis*, Borneo; for *javanesis*, Java and Bali; for *minutus*, Palawan, Phillipines; for *sumatranus*, Sumatra and Nias

Population: Unknown

Data Quality:

Field Studies: Unaware of specific efforts

Threats: Unknown

Concerns/Comments: The estimated global population for entire the species is 1 million individuals. Although solitary, nothing else in known about the social system of this species. The 4 insular subspecies are of special concern and may be at risk because of fur trade, human encroachment and conversion of habitat for agricultural purposes. They appear to have immunology problems in captivity.

Recommendations:

Research/Management: Survey and continue monitoring of wild population status, taxonomy to determine species uniqueness and level of genetic variation and husbandry to enhance captive propagation and address immunology problems.

Captive Program: After resolving the taxonomic issue, establish one or more small nuclear populations with 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos] from the wild.

PHVA: Not required.

Captive Population: For *borneoensis*, 0 individuals; for *javaensis*, 0; for *minutus*, 0; and for *sumatranus*, 0

***Panthera pardus delacouri* (Southeast Asian leopard)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Southeastern Asia
Population: <5,000
Data Quality: Indirect information
Field Studies: Some surveys conducted in Cambodia and Laos
Threats: Loss of habitat and hunting
Concerns/Comments: The estimated global population is fewer than 10,000 individuals and declining. The ISIS data require confirmation.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Some blood/tissue samples have been obtained to resolve taxonomy issue, but more are needed.

Captive Program: None recommended at the present time.

PHVA: Not required.

Captive Population: 7 individuals

Panthera pardus millardi (Nepal leopard)

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Nepal
Population: <2,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting and loss of habitat
Concerns/Comments: The estimated global population is fewer than 2,000 individuals and declining.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Blood/tissue samples will be difficult to obtain, so taxonomy is not likely to be resolved.
Captive Program: None recommended at the present time.
PHVA: Not required.
Captive Population: 0 individuals

Panthera pardus pernigra (Bhutan leopard)

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered
Distribution: Bhutan
Population: <2,000
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Hunting and loss of habitat
Concerns/Comments: The estimated global population is fewer than 2,000 individuals and declining. Good habitat still exists, and there is little poaching.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Because the validity of this subspecies is questionable, obtaining blood/tissue samples probably is a low priority.
Captive Program: None recommended at the present time.
PHVA: Not required
Captive Population: 1 individual

Felis bengalensis: chinensis, euptilara, horsfieldi, manchurica, travellani **(Leopard cat spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Unlisted
Distribution: Widespread from Indian subcontinent through southern and eastern Asia
Population: 1,000,000 for the species
Data Quality: Indirect information
Field Studies: Recent work in Thailand with radio-collared animals
Threats: Unknown
Concerns/Comments: *Euptilara* is considered by some to possible be a separate species. The estimated global population for the entire species is 1 million individuals. The validity of all 11 subspecies has not been assessed and is in need of evaluation. No information for wild populations is available at the subspecific level, but at least some populations appear to be quite heavily harvested (at least 41,000 skins annually, 1983-1988). Captive propagation has been accomplished, but there are immunology problems. A major issue to be addressed is if a captive breeding program is necessary.
Recommendations:

Research/Management: Survey of wild population status, taxonomy to determine subspecies uniqueness and biomedical to address the immunology problem.

Captive Program: Establish a small nuclear population within 5 to 7 years and maintain target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required.
Captive Population: For *euptilura*, 61 individuals; *for chinensis,* 23; for generic, 22?

***Felis silvestris: silvestris, caudauta, caucasia, cautuchta, cretensis, issikulensis, kozlovi, matschiei, molisana, morea, murgabensis, reyi, sarda, shavwiana, vellerosa* (European wildcat spp.)**

Status: Mace-Lande: Vulnerable?
CITES: Appendix II
USFWS: Unlisted
Distribution: Throughout Europe, Middle East to central Asia
Population: 500,000, *F.s. silvestris*
Data Quality:
Field Studies: Studies in progress (e.g., ongoing, ecology studies of French population; see Foreman's bibliography*)
Threats: Hybridization
Concerns/Comments: Because there are 15 recognized subspecies, a high priority is to settle the issue of subspecies distinctiveness. A major problem is that this species readily hybridizes with domestic cats. *F. silvestris* almost is extinct on the western coast of Europe, but numbers increase eastward. Populations are very location dependent - in some areas animals are killed as pests and in some areas they are protected. Overall, the trend is that the species is in decline.
Recommendations:

Research/Management: Survey to determine wild population status and taxonomy to determine subspecies uniqueness and level of hybridization.

Captive programs: Level 2: establish a small nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic material [sperm/embryos]) from the wild. Until taxonomy is resolved, the European wildcat should be managed on the basis of geographic origin.

PHVA: Not required.

Captive Population: For *silvestris silvestris*, 33 individuals; for *silvestris caucasica*, 1; for generic, 6 individuals

***Felis concolor: mayensis, costaricensis* (Central American puma spp.)**

Status: Mace-Lande: Vulnerable?/Endangered?
CITES: Appendix I (*costaricensis*); Appendix II (*mayensis*)
USFWS: Endangered (*costaricensis*); Unlisted (*mayensis*)
Distribution: Mexico, Central America
Population: For *costaricensis*, 500; for *mayensis*, 1,000
Data Quality: Indirect information
Field Studies: Some surveys conducted in Costa Rica and Mexico.
Threats: Loss of habitat and fragmentation, human interference, hunting
Concerns/Comments: These 2 subspecies are considered vulnerable because of potential human development pressures upon habitat.
Recommendations:
Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies uniqueness.
Captive Program: None recommended.
PHVA: Yes
Captive Population: For *costaricensis*, ~30 individuals; for *mayensis*, 50 individuals.

***Felis concolor: azteca, browni, californica, cougar, hippolestes, improcera, kaibabensis, missoulensis, oregonensis, schorgeri, stanleyana* (North American puma spp.)**

Status: Mace-Lande: Vulnerable, *azteca, browni, cougar, hippolestes, improcera, kaibabensis, stanleyana*; Vulnerable/Safe, *californica, missoulensis, oregonensis*; Extinct, *schorgeri*

CITES: Appendix II, Appendix I: *F.c. cougar* only

USFWS: Endangered, *F.c. cougar*

Distribution: Western North America (Alaska into Mexico); Vancouver Island

Population: For *azteca*, >250; for *browni*, 250; for *californica*, 5,000-10,000?; for *cougar*, unknown; for *hippolestes*, 1,000-2,500??; for *improcera*, unknown; for *kaibabensis*, >5,000; for *missoulensis*, >10,000; for *oregonensis*, >10,000; for *stanleyana*, 300-500; for *schorgeri, 0.*

Data Quality: Indirect information

Field Studies: Many ongoing studies in range states: New Mexico, Texas, Utah, Idaho, Arizona, Alberta (Canada) (e.g., Hornocker, Lindsey, Murphy, Anderson and others).

Threats: Loss of habitat and human interference; vancouverensis may be particularly susceptible to loss of habitat.

Concerns/Comments: All subspecies are considered "Vulnerable" or "Vulnerable/Safe", primarily because of high probability of short-term habitat loss. Genetic studies are on-going to address the subspecies issue. Currently there are 212 "generic" pumas in captivity, and it is highly questionable if these individuals are useful to any captive conservation efforts. There are more pumas in the private sector than in zoos. It is possible that the *browni* subspecies will be listed formerly as threatened. Because of this, the Arizona Fish and Game department is beginning a morphological study to determine if the *browni* is a distinct subspecies from other Arizona subspecies (*azteca* and *kaibabensis*). If *browni* is determined to be taxonomically-unique, then Arizona will put effort into protecting this population. Several subspecies are legally shot for animal damage control in Western States. Attacks on humans have been reported on Canada's Vancouver Island and in some western states in the United States.

Recommendations:

Research/Management: Taxonomy research should continue as well as monitoring status of wild populations.

Captive Program: Based upon molecular, taxonomic findings, establish a small nuclear population within 5 to 7 years and maintain a target level of 90% genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild. This will require about 25 or more captive animals over the next 5 to 7 years.

PHVA: Not required.

Captive Population: For *azteca*, 5; for *browni, californica*, and *cougar*, 0; for *hippolestes*, 14; for *improcera*, 1; for *kaibabensis*, 3; for *missoulensis*, 8; for *oregonensis*, 6; for *stanleyana*, 11; for *schorgeri* 0; for generics, 234 individuals

***Felis concolor: acrodocia, anthonyi, aruacanubis, bangsi, borbensis, cabrerae, capricornensis, concolor, greeni, incarum, osgoodi, patagonica, pearsoni, puma, soderstromii* (South American puma spp.)**

Status: Mace-Lande: Vulnerable/Secure? (Brazil); Vulnerable (Paraguay, Argentina, Peru, and Bolivia)
CITES: Appendix II
USFWS: Not listed
Distribution: South America
Population: >100,000
Data Quality: Recent anecdotal field sightings
Field Studies: Some detailed surveys have been made (e.g., *patagonica).* Commonly seen in Altoparana in Paraguay. Julieta von Thungen and Betsy Howell are beginning a radio-telemetry study in Cuyo, Argentina.
Brazil - In Carajás Project in Pará state radiotelemetry studies (on 1 puma) are being carried out by Crawshaw. Other studies include: diet and occurrence of puma in Atlantic forest in Parana state (M.R. Pereira Leite, IBAMA/UFPR); diet and status in Buriticupu, maranhao state (T.G. de Oliveira); radiotelemetry of puma in Pantana - Porto Primavera and Miranda (Crawshaw/IBAMA); occurrence of puma in Santa Catarina state (Mazolli, Marcelo/UFSC); diet and occurency of puma in Espirito Santo state (S.L. Mendes/MBML); studies on livestock depredation and relative population density in Paraguaizinho watershed (J. Dalponte/Ecotropica); ongoing project concerning livestock depredation in Atlantic forest with radiotelemetry monitoring (J.A. Silva); diet and occurency of puma in Emas National Park (L. Silveira/IBAMA); impact studies of depredation in livestock - Pocone - Pantanal (R.P. Boulhosa/IBAMA, Phoenix Zoo).
Paraguay - According to an assessment of felid populations in Paraguay by Señora Nora Neris de Colman, this species, along with *F. geoffroyi*, and *F. yaguaroundi* are seen most frequently.
Threats: Habitat loss and fragmentation, human interference, hunting for livestock protection, (predator control).
Concerns/Comments: There is a general consensus in South America that *Felis concolor* should be considered a general species until molecular genetic analysis (currently underway) determines that specific subspecies exists. At that time, more attention can be directed at the need for wild management and the development of organized captive breeding programs. Currently, there is a need for more population surveys (with monitoring) to begin to determine numbers in the wild. Throughout South America, a significant number of local animals are killed by human disturbance. Almost all pumas in South American zoos are not in any type of inventory or management system.
Paraguay - A major problem in Paraguay is extensive deforestation leading to fragmentation of habitat and puma populations.
Bolivia - Elevations in Bolivia range from 100 m to 4,800 m, and pumas are found in all of these areas. In Bolivia, as many as 500 animals were poached for skins per year. The Bolivian government has been working to protect pumas, and the population is thought to be increasing in the past few years. Every 2 years captive-bred animals are successfully

reintroduced into protected areas in Bolivia.
Guatemala - The governmental agency for wildlife in Guatemala is working on protecting pumas as well. The species is classified by the authorities as endangered in Guatemala.
Brazil - In the Pantanal near the Paraguayzinho River (an effluent of the Paraguay River), there is an estimated one cat per 40 square km of habitat. In the state of Mato Grosso, there are wetlands, central savannahs and forests. Savannahs are the most threatened of the habitats in Mato Grosso because of expansion of soybean farming; this, is turn, has led to a marked decline in puma numbers. In the Amazon region, puma populations are good. The same situation may be found along the rivers (wetlands) near Araguaya, Guaporé, and Paraguay. In Minas Gerais, information was collected about livestock depredation (1991); farmers reported killing the livestock by pumas especially colts and old horses. In the Atlantic forest of Parana state, distribution and nutrition analysis of puma scats is being performed. Nutritional analysis of puma scats from the national park of Superagui indicates that pumas eat mainly armadillos. In Bahia state, in the last of Atlantic forest 6,000 hectares only 2 pumas were seen. In the state of Espirito Santo, there is a reserve of 46,000 hectares, and pumas are evident. Another reserve with 4,000 hectares (managed by IBAMA) is connected to private lands, and pumas move among the habitats through these various connecting corridors, even though the habitat is extremely fragmented. The problem is that the large felids are beginning to eat domestic animals which is a problem. In fact, the predation of livestock by pumas is the primary problem seen by puma biologists, and the one that must be addressed in the near future to protect the stability of the species as a whole. This predation is leading to increased hunting by local ranchers. In Iguasu National Park in Southern Brazil, no pumas have been trapped in 4 years (except one weak, young dispersing male). Several pumas have been sighted in the area, and biologist believe that pumas are simply less trap-prone than jaguars. It is apparent in the Iquasu National Park that jaguars are more abundant than pumas; there are some indications that the opposite is true for the Argentinean part of the Park. In the province Misiones, Iguacu National Park, pumas seem to be more abundant than jaguars (which may no longer exist there). In December of 1991, a young boy was killed in Carajás which was the trigger for the radiotelemetry investigations being carried out there. There will be a hydroelectric plant flooding Matto Grosso do Sul in Sao Paolo State in 1994 with pre- and post-flood tracking of animals. One monitored female was found to be using 100 sq. km. of home range.
Argentina - In Argentina there are no recent field studies. It is believed, however, that the puma is not threatened. The exceptions would be *hudsonii, wh*ich lived in the highly modified grasslands and old mountains of the Pampas region, and *capricornensis* which is thought to exist only in the remnant rainforest in Misiones province; therefore, these subspecies perhaps should be considered threatened until more molecular data are available indicating if they are specific subspecies. In some provinces of Argentina, the hunting of pumas is allowed.
Uruguay - According to Ximenez, puma do still occur in Uruguay even if in low numbers.
Recommendations:

Research/Management: Ongoing taxonomic studies; translocation; survey; limiting factors research (emphasizing assessment of the impact of livestock predation by pumas including scat analysis); monitoring; husbandry research (needed to maintain healthy

populations in captivity since zoos frequently are forced to maintain and hold problem wild-caught individuals); habitat management; life history research

Captive Program: Pending taxonomic data

PHVA: Not required

Captive Population:

Bolivia - ~22 in 4 zoos

Paraguay - 16 in 2 sites

Argentina - At least 25 in 5 zoos.

Brazil - Census of Brazilian zoos indicated 138 animals in 38 Brazilian zoos; 14 born in past year (35% newborn mortality; 10% overall mortality).

Numbers are needed for the remaining countries in South America. Michelle Schireman at Zoo Atlanta is producing a cougar registry and has already sent surveys to zoos in Central and South America. She has received replies and is entering the data into SPARKS.

***Felis concolor: vancouverensis* (Vancouver Island puma)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Unlisted
Distribution: Vancouver Island, Canada
Population: <500
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Loss of habitat
Concerns/Comments: This population deserves conservation attention because of its isolation. Population appears to be self-sustaining.
Recommendations:
Research/Management: Taxonomy to determine uniqueness, especially with adjacent mainland populations.
Captive Program: None.
PHVA: Not required.
Captive Population: 5 individuals

***Lynx rufus escuinapae* (Mexican bobcat)**

Status: Mace-Lande: Vulnerable
CITES: Appendix II
USFWS: Endangered
Distribution: Mexico
Population: Unknown
Data Quality:
Field Studies: Unaware of specific efforts
Threats: Unknown
Concerns/Comments: The status of this subspecies, including animal numbers, is unclear.
Recommendations:
Research/Management: Taxonomy.
Captive Program: None at the present time.
PHVA: Required and should include this subspecies as part of a multi-species PHVA in Mexico to identify conservation priorities and a management plan.
Captive Population: 7 individuals listed in ISIS

***Felis tigrina: guttula, tigrina* (Tiger cat spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered

Distribution: guttula - Central Brazil to Northern Argentina; tigrina - Amazon basin and Northeast Brazil.

Population: >10,000

Data Quality: Recent anecdotal field sightings

Field Studies: Ongoing radio-telemetry field work in Mirador State Park in northeast Brazil (T.G. de Oliveira). Diet study in the Atlantic forest of Paraná state (R. Leite: UFPR/IAMA) According to an assessment of felid populations in Paraguay by Señora Nora Neris de Colman, this species, is not seen and is thought not to occur in this area.

Threats: Habitat loss and fragmentation; susceptible to human interference/disturbance, hunting in Argentina, common pets and predator control for livestock protection.

Concerns/Comments: Some believe that the tiger cat, margay and kodkod are extremely difficult to differentiate. This species commonly preys on chicken coups. Hybridization has occurred in European captive populations. Because of the numbers of tiger cats in captivity, a studbook is needed. *Felis tigrina oncilla* might be taxonomically distinct from other *tigrina* populations. Future studies will clarify this issue. The tiger cat is found in savannas, dry-thorny scrub and sugar cane plantations in Brazil, and not exclusively in forests as previously thought for the species (T.G. de Oliveira).

Recommendations:

Research/Management: Survey and monitoring of wild population status in various countries, taxonomy to determine subspecies uniqueness; life history studies. Husbandry to enhance captive propagation.

Captive Program: Level 1. Establish a viable, self-sustaining, captive population within 5 to 7 years capable of maintaining 90% genetic diversity for 100 years.

PHVA: Required in conjunction with a PHVA for the ocelot and margay.

Captive Population: The current North American population contains 22 animals resulting from 7 founders. Of the 7 founders, 3 are still alive and reproducing. An additional 3 founders exist in Europe. There are 80 individuals in the Brazilian zoos and approximately 10 in 2 Brazilian Breeding Centers. In 1993, there were 4 animals born in zoos of which one survived (at Sorocaba Zoo); the other three animals were born at the Itaipu Binacional Breeding Center of which two are still alive (Leusos SZB, 1993; H.M. Fonles Jr., Itaipu Binacional). Currently, Sao Paulo Zoo holds 17 *tigrina* with a total of 77 in captivity in Brazil. Three have been captive born during 1994 with two surviving (2 - Sao Paulo, 1 - N. Brazil Zoo).

Felis wiedii vigens

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS:
Distribution: Guiana highlands, Northern Brazil
Population: >5,000
Data Quality: Recent anecdotal field sightings
Field Studies:
Threats: Loss of habitat, loss of habitat due to fragmentation, human interference
Concerns/Comments:
Recommendations:
Research/Management: Survey, monitoring, life history studies, husbandry, and taxonomy
Captive Program: Level 3
PHVA: Yes, for species
Captive Population: <10, problem with identification of subspecies

***Felis pardalis: aequatorialis, maripensis, mearnsi, nelsoni, pardalis, pseudopardalis, pusaeus, sonorensis, steinbachi* (Ocelot spp.)**

Status: Mace-Lande: Vulnerable
CITES: Appendix I
USFWS: Endangered

Distribution: Wide distribution throughout Central and South America, some fragmented areas.

Population: >10,000

Data Quality: Recent general field study

Field Studies: Manu National Park (L. Emmons); Venezuela (Ludlow/Sunquist), Belize (Konecny). A study is ongoing in Mirador State Park, in the state of Maranhao (T.G. de Oliveira).

Threats: Loss of habitat, loss of habitat due to fragmentation, human interference, fur trade, opportunistic hunting, human persecution (predator control for livestock protection; cats are being shot if seen near livestock).

Concerns/Comments: In current North American population, few to no individuals are traceable to wild-caught founders. Brazilian Zoo Society (SZB), Ciliary Forest Association (AMC) and IBAMA are coordinating a Management Plan for *Felis pardalis* (C. Adania, Studbook keeper).

Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. The subspecies *pseudopardalis* is found on 3 islands (Trinidad, Tobago, Margrita). Taxonomic and survey analyses are highly recommended for future population management. Husbandry research also recommended.

Captive Program: Level 2. Help develop a captive breeding program in the range country. Establish a nuclear population within 5-7 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild. There is a Brazilian Management Protocol published in December, 1993 in conjunction with the Ocelot Management Plan (C. Adania, Studbook keeper). Ex situ reproductive studies are underway in Itaipu and Federal University of Parana and Sao Paulo Zoo for *F. pardalis, F. wiedii* and *F. tigrina.*

PHVA: Required and conducted simultaneously with a PHVA for the tiger cat and margay.

Captive Population: 400-500; 130 in captivity in Brazil (Brazilian studbook)

***Felis yagouaroundi: ameghino, cacomitlli, eyra, fossata, melantho, panamensis, tolteca, yagouaroundi* (Jaguarundi spp.)**

Status: Mace-Lande: Vulnerable (*eyra, melantho, yagouaroundi*);
Endangered (*cacomitlli, fossata, panamensis, tolteca*); *ameghino*, Unknown
CITES: Appendix I (for North and Central American populations
USFWS: Endangered (for North and Central American subspecies)

Distribution: Southern Texas through Mexico, Central America and into South America, east of Andes to northern Argentina.

Population: >10,000 (*cacomitlli* - 1,000)

Data Quality: Recent anecdotal field sightings

Field Studies: 1985 - Belize, 3 individuals were radio-collared; Venezuela (Bisbal); Texas, Tamaulipas, Mexico (Tewes). Ongoing field work in Mirador State Park (T.G. de Oliveira).

Threats: Habitat loss and fragmentation and human interference/disturbance may impact populations, hunting for livestock protection.

Concerns/Comments: Adaptability to habitat fragmentation is unknown, but this species is found in a variety of natural and modified habitats. Most commonly observed, adaptable to various habitats, seen near Sao Paulo. In current North American population, few to no individuals are traceable to wild-caught founders. One approach is the development of a captive breeding program outside the range country for 1 subspecies, *fossata*, by acquiring founders from Guatemalan zoos. This, however, is impossible because of its listing on Appendix I. Aide should be given to Guatamalan zoos to help with the development of a breeding program for this species in that country.

Recommendations:

Research/Management: Survey of wild population status, taxonomy to determine subspecies uniqueness, husbandry research to enhance captive propagation, monitoring.

Captive Program: Level 2

PHVA: Not required

Captive Population: *Felis yagouaroundi cacomitli,* 1 individual; *F.y. fossata,* 7 individuals; *F.y. panamensis,* 3 individuals; *F.y. tolteca,* 4 individuals; for generic, 54 individuals (from ISIS). 58 in Brazilian zoos in 1992.

***Felis geoffroyi: euxantha, geoffroyi, paraguae, salinarum* (Geoffroy's cat spp.)**

Status: Mace-Lande: Vulnerable
(*F.g.euxantha:* Endangered, *F.g. salinarun:* Critical; T.G. de Oliveira)
CITES: Appendix I
USFWS: Unlisted

Distribution: Bolivia, Argentina, Brazil, Uruguay, Paraguay, Chile

Population: >10,000

Data Quality:

Field Studies: Ongoing radio-tracking studies in southern Chile; Argentina (J. Rabinovich); Paraguay (Brooks); Torres del Paine (Johnson); according to an assessment of felid populations in Paraguay by Señora Nora Neris de Colman, this species, as well as *F. concolor* and *F. yaguaroundi* is very rarely seen.

Threats: Loss of habitat; loss of habitat due to fragmentation; human interference/disturbance; hunting; fur trade

Concerns/Comments: Geoffroy's cat recently has been moved from CITES Appendix II to I. This species inhabitants a variety of habitats including scrub woodlands, open bush, rocky terrain and riverine forest. The species is solitary with the home ranges from 1.35 square km (juvenile female) to 12.4 square km (adult male). Most frequently observed spotted cat in the southern cone - based on field studies and the number of animals coming into zoos. Largest number hunted for fur trade.

Recommendations:

Research/Management: Survey and monitoring of wild population status and taxonomy to determine subspecies/geographic uniqueness.

Captive Program: Level 2; Establish a nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required

Captive Population: There are 59 individuals held by zoos participating in ISIS. The North American population is between 40 and 50 individuals originating from 7 founders, and the population is fairly inbred (this population may contain an undetermined number of subspecies). The European population is from 7 founders. *Felis geoffroyi geoffroyi*, 2 individuals; *F.g. salinarum*, 9 individuals; for generic, 48 individuals (in ISIS); limited captive breeding program in Ushaian, Argentina. 70 for all ssp. The species is easily obtained and there are at least 20 animals in Argentina zoos (La Plata Zoo - 3-4 animals; Buenos Aires zoo - 11 animals (including 2 melanistic animals thought to be Geoffroy's). The Sao Paulo Zoo maintains 1.0 animals (melanistic phase). In southern Brazil, county of origin for animals in this zoo is Cachoeira do Sul (*Felis geoffroyi paraguae).* There appears to be no captive breeding in range countries, although there is a large turnover of cats. Based upon this total number in captivity and its Appendix I status, a studbook is warranted if a captive breeding program is to be established.

FELID CONSERVATION ASSESSMENT AND MANAGEMENT PLAN AND GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

SECTION 6

SPREADSHEET AND TAXON DATA SHEETS FOR SAFE FELID TAXA

Table 9. **SAFE FELID TAXA**

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKS P	RSCH MGMT	NUM	DIFF	REC
5	Felis (Prionalilurus)	bengalensis Leopard cat	Asia	1,000,000	4	YES	D		S	H,I,L	NO	T,S,H,M	32		LEV 2
20	Felis	chaus Jungle cat	Europe, Africa, Asia	>100,000	5	FRG	?		S	I,Hyb	NO	T,S	68	1	LEV 2
21	Felis	chaus affinis	Kashmir to Yunan						S		NO	T,S			
22	Felis	chaus chaus	Turkistan to Iran, Pakistan						S		NO	T,S			
23	Felis	chaus fulvidina	Assam to Thailand						S		NO	T,S			
24	Felis	chaus furax	Middle East						S		NO	T,S			
25	Felis	chaus kelaarti	Sri Lanka, S. India						S		NO	T,S			
26	Felis	chaus kutas	N. India						S		NO	T,S			
27	Felis	chaus nilotica	Egypt						S		NO	T,S			
28	Felis	chaus prateri	S.& W. India						S		NO	T,S	5		
37a	Felis	concolor Puma	Brazil	?			S		S	L,Lf,P, H,Ic	NO	Lr,S,H,Hm T,M,Tl	138	1	P
109	Felis (Leptailurus)	serval	Africa						S						
110	Felis	serval serval	S.E. Africa	< 100,000	4	15	D?		S	H	NO	T	194	1	LEV 2

111	Felis	serval beirae (= serval)			4				S	H	NO	T			
112	Felis	serval brachyura	Senegal to Ethiopia		4				S	H	NO	T			
114	Felis	serval hamiltoni (=serval)			4				S	H	NO	T			
115	Felis	serval liptosticta	E-C Africa		4				S	H	NO	T	4		
116	Felis	serval ingridi (=serval)			4				S	H	NO	T	8		
117	Felis	serval kempi (=serval)			4				S	H	NO	T	1		
118	Felis	serval kivuensis (=liptosticta)			4				S	H	NO	T			
119	Felis	serval limpopooensis (=serval)			4				S	H	NO	T			
120	Felis	serval lonnbergi (=serval)			4				S	H	NO	T			
121	Felis	serval phillipsi	Sudan		4				S	H	NO	T			
122	Felis	serval togoensis	Togo and Dahomey		4				S	H	NO	T			
136	Felis	silvestris lybica	North Africa	>500,000	4	YES	D		S?	Hyb	NO	T,S,H	2		LEV 2
180	Lynx	canadensis Canadian lynx	North America	>100,000	4	?	S	G	S	?	NO	T	73	1	N
181	Lynx	canadensis canadensis	Alaska, Canada, N. United States				D		S	?	NO	T			N
182	Lynx	canadensis subolanus	Newfoundland				?		S	?	NO	T	4		N

184	Lynx	caracal algirus	N. Africa		4				S	H	NO	T			LEV 2
185	Lynx	caracal caracal	East Africa		4	YES	D		S	H	YES	T	9		LEV 2
186	Lynx	caracal damarensis	S.W Africa		4		D		S	H	NO	T	27		LEV 2
187	Lynx	caracal limpopoensis	S.C. Africa		4				S	H	NO	T			LEV 2
188	Lynx	caracal lucani	N.W. Angola & Gabon		4				S	H	NO	T			LEV 2
190	Lynx	caracal nubicus	E. Africa						S	H	NO	T			N
191	Lynx	caracal poecilotis	W. Africa						S	H	NO	T	4	1	LEV 2
194	Lynx	lynx dinniki	N. Caucuses and Iraq	?	5				S	?	NO	T			N
195	Lynx	lynx isabellina	Kashmir, C. Russia, Mongolia	>10,000?	5	YES			S	?	NO	T			N
196	Lynx	lynx kozlovi	C. Siberia	>10,000?	5	YES			S	?	NO	T			N
197	Lynx	lynx lynx	Europe	?	5				S	?	NO	T	34		N
198	Lynx	lynx sardiniae	Sardinia	?	5				S	?	NO	T			N
199	Lynx	lynx stroganovi	Coastal Siberia, Korea, Mancheria	?	5				S	?	NO	T			N
200	Lynx	lynx wrangeli	N.E. Siberia	?	5				S	?	NO	T	47		N
202	Lynx	rufus (bobcat)	S. Canada-C. Mexico						S		NO	T	136	1	N

203	Lynx	rufus bailey	S.E. California to Kansas, Central Mexico				S		S	?	NO	T	2		N
204	Lynx	rufus californicus	California				S		S	?	NO	T	4		N
206	Lynx	rufus fasciatus	S. Canada	>100			S		S	?	NO	T	2		N
207	Lynx	rufus floridanus	S.E. United States	10,000-100,000			S		S	?	NO	T	11		N
208	Lynx	rufus gigas	Maine and Canada	>100			S		S	?	NO	T	1		N
209	Lynx	rufus oaxacensis	C. Mexico	>100			S		S	?	NO	T	0		N
210	Lynx	rufus pallescens	Rocky Mtns.	>1,000 to 10,000			S		S	?	NO	T	11		N
211	Lynx	rufus peninsularis	Baja	>100			S		S	?	NO	T	0		N
212	Lynx	rufus rufus	New England, C. United States	>1,000			S		S	?	NO	T	10		N
213	Lynx	rufus superiorensis	Upper Midwest	>1,000			S		S	?	NO	T	0		N
214	Lynx	rufus texensis	Texas, N.E. Mexico	>1,000			S		S	?	NO	T	6		N
246	Panthera	pardus adusta	Ethiopia	5,000	3	YES	I		S	H	YES	S,T	0		N
247	Panthera	pardus chui	W. Kenya, Uganda	5,000	3	YES	I		S	H	YES	S,T	0		N
252	Panthera	pardus ituriensis	Zaire	>100,000	3	NO	S		S		YES	S,T	0		N
257	Panthera	pardus melanotica	Cape Africa	<500	3	YES	D		S	H	YES	T,S	8		N
270	Panthera	pardus suahelica	E. Africa	50,000	3	YES	S		S	H,Po	YES	S,T	0		N

***Felis silvestris: lybica, brockmani, cafra, foxi, griselda, haussa, mellandi, nandae, ocreata, pyrrhus, rubida, taitae, tartessia, ugandae* (African wildcat ssp.)**

Status: Mace-Lande: *F.s. lybica*, Safe; all other subspecies, Vulnerable
CITES: Appendix II
USFWS: Unlisted

Distribution: Ranges throughout most of Africa with the exception of the east, central regions
Population: for *lybica*, >500,000; for animals of unknown subspecies, >100,000
Data Quality: Indirect Information
Field Studies: Unaware of specific efforts
Threats: Hybridization
Concerns/Comments: Because 14 subspecies are recognized, a high priority is to settle the issue of subspecies distinctiveness. The primary threat is hybridization with domestic cats, but the species also is being reduced by habitat destruction, hunting and the fur trade. Overall, however, the species appears fairly stable in situ.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness and level of hybridization.

Captive Program: For *lybica*, level 2: establish a nuclear population within 3 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild. Until taxonomy is resolved, the African wildcat should be managed on the basis of geographic origin.

PHVA: Not required.

Captive Population: For *lybica*, 2 individuals (questionable taxonomy); for *taitae*, 1 individual; for *ugandae*, 1 individual; for generics, 3.

Felis serval: beirae, brachyura, constantina, hamiltoni, hindei, ingridi, kempi, kivuensis, limpopoensis, lonnbergi, liposticta, phillipsi, serval, tanae, togoensis
(Serval spp.)

Status: Mace-Lande: Safe (*F.s. constantina*, extinct)
CITES: Appendix II
USFWS: Endangered, *constantina*
Distribution: Widely distributed and quite abundant in countries south of the Sahara
Wild Populations: <100,000
Data Quality: Indirect information
Field Studies: Some research in progress (e.g., ecology in Tanzania [Gertseema] and South Africa [Bowland]; see Foreman's bibliography)
Threats: Hunting
Concerns/Comments: The estimated global population is fewer than 100,000 individuals. This species experiences 2 different coat patterns, one distinctive to western Africa and one to southern Africa. Because 15 subspecies have been identified, a high priority is to settle the issue of subspecies distinctiveness. The subspecies constantina may be extinct. The species prefers to inhabit wetlands and frequently is hunted by natives for ceremonial robes and because it kills poultry. There are many servals owned by the private sector, most originating from southern Africa.
Recommendations:
Research/Management: Taxonomy to determine subspecies uniqueness.
Captive Program: Level 2: establish a nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild. Until taxonomy issue is resolved, servals should be managed as separate geographic populations.
PHVA: Not required.
Captive Population: For *liptosticta*, 4 individuals; for *ingridi*, 8; for *kempi* 1; for generic, 194. Almost all servals in North America are from South Africa; many are in the private sector. North American studbook has been approved.

***Lynx caracal: caracal, algirus, damarensis, limpopoensis, lucani, nubicus, poecilotis* (Caracal spp.)**

Status: Mace-Lande: Safe
CITES: Appendix II (African population); Appendix I (Asian population)
USFWS: Unlisted

Distribution: Northern, central and southern Africa through parts of the Middle East, Saudi Arabia, the former U.S.S.R., Afghanistan, Pakistan northwest and central India

Population: <100,000

Data Quality: Indirect information

Field Studies: Unaware of specific efforts

Threats: Hunting

Concerns/Comments: The estimated global population is fewer than 100,000 individuals. Because subspecies have been identified, a high priority is to settle the issue of subspecies distinctiveness. This species can exist in very sparse, dry areas and, if given the opportunity, prefers to prey upon sheep. Therefore, numbers are decreasing in southern Africa and Namibia, primarily because they are considered pests. This species is not threatened by the fur trade. There are many captive caracals owned privately.

Recommendations:

Research/Management: Taxonomy to determine subspecies uniqueness.

Captive Program: Establish a nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic material [sperm/embryos]) from the wild. Until the taxonomy issue is resolved, caracals should be managed as separate geographic populations.

PHVA: Not required.

Captive Population: For *caracal*, 9 individuals; for *damarensis*, 27; for *poecilotis*, 4; for generic, 113.

Panthera pardus adusta (Ethiopian leopard)

Status: Mace-Lande: Safe
CITES: Appendix I
USFWS: Endangered
Distribution: Ethiopia
Population: 5,000
Data Quality: Recent anecdotal field sightings
Field Studies: Surveys have been conducted
Threats: Hunting
Concerns/Comments: The estimated global population is approximately 5,000 individuals and increasing. Ethiopia has set aside some protected areas.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Blood/tissue samples have not been obtained to help resolve taxonomy issue.
Captive Program: None recommended.
PHVA: Yes
Captive Population: 0 individuals

Panthera pardus chui (West Kenyan, Ugandan leopard)

Status: Mace-Lande: Safe
CITES: Appendix I
USFWS: Threatened
Distribution: Western Kenya, Uganda
Population: 5,000
Data Quality: Recent anecdotal field sightings
Field Studies: Unaware of specific efforts
Threats: Hunting
Concerns/Comments: The estimated global population is approximately 5,000 individuals and is increasing.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Blood/tissue samples have not been obtained to help resolve taxonomy issue.
Captive Program: None recommended.
PHVA: Yes
Captive Population: 0 individuals

***Panthera pardus ituriensis* (Zaire leopard)**

Status: Mace-Lande: Safe
CITES: Appendix I
USFWS: Threatened
Distribution: Zaire
Population: >100,000
Data Quality: Recent anecdotal field sightings
Field Studies: Unaware of specific efforts
Threats: none
Concerns/Comments: The estimated global population is more than 100,000 individuals and is stable. This subspecies is very abundant and protected within park boundaries. It is not protected outside of the parks but there is little evidence of poaching.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Blood/tissue samples have not been obtained to help resolve taxonomy issue, but it is unlikely that materials can be obtained from wild-caught animals.
Captive Program: None recommended.
PHVA: Yes
Captive Population: 0 individuals

***Panthera pardus melanotica* (South African leopard)**

Status: Mace-Lande: Safe
CITES: Appendix I
USFWS: Threatened
Distribution: South Africa
Population: <500
Data Quality: Recent anecdotal field sightings
Field Studies: Studies on-going in the Cape Province of South Africa
Threats: Hunting
Concerns/Comments: The estimated global population is fewer than 500 individuals and declining. This subspecies is fairly well managed in parks. However, more management is needed due to the interaction with domestic sheep and goats.
Recommendations:
Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. Because this probably is not a valid subspecies, further blood/tissue samples are needed to help resolve taxonomy issue.
Captive Program: None recommended at present time.
PHVA: Yes
Captive Population: 8 individuals

***Panthera pardus suahelica* (Kenyan, Tanzanian leopard)**

Status: Mace-Lande: Safe
CITES: Appendix I
USFWS: Threatened
Distribution: Kenya, Tanzania
Population: 50,000
Data Quality: Recent anecdotal field sightings
Field Studies: Fumi Mizutami from Cambridge
Threats: Hunting and Poisoning
Concerns/Comments: The estimated global population is approximately 50,000 and stable. This subspecies is well-managed and is a game animal in Tanzania
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness. A single blood/tissue sample is available from a wild-caught animal, and it likely is possible to obtain more samples to address taxonomy issue.

Captive Program: None recommended.

PHVA: Yes
Captive Population: 0 individuals

***Felis chaus* (Jungle cat)**

Status: Mace-Lande: Safe
CITES: Appendix II
USFWS: Unlisted
Distribution: Sri Lanka
Population: >100,000 (no subspecies)
Data Quality:
Field Studies: Unaware of specific efforts
Threats: Human interference and hybridization
Concerns/Comments: The estimated global population of the species is greater than 100,000 individuals. The Sri Lankan insular subspecies should be an area of focus. Virtually no data are available on numbers for most subspecies (10 subspecies of chaus have been designated). There are anecdotal suggestions that this species may be hybridizing with domestic cats, but no supportive scientific data exists. This species is being persecuted by farmers and to a minor extent for the fur trade. Based on lack of animals held in Asian zoos, live animals or skins on the animal market, this species warrants further attention to assess status. A priority would be to survey protected areas in range countries to determine presence or absence.
Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness and extent of hybridization with domestic cats.

Captive Program: Establish a small nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (or genetic materials [sperm/embryos]) from the wild.

PHVA: Not required.
Captive Population: None

***Felis chaus: affinis, chaus, fulvidina, furax, kelaarti, kutas, nilotica, oxiana, prateri* (Jungle cat spp.)**

Status: Mace-Lande: Safe
CITES: Appendix II
USFWS: Unlisted

Distribution: Widespread across Egypt, Europe (the former U.S.S.R. and Ciscaucasian area), Asia. Specifically, its distribution also spans Israel, Jordan, and Syria in the east, north to the Caspian Sea, and Afghanistan and east through India, Nepal, Sri Lanka, Thailand, southwestern China and into Indochina.

Population: >100,000 for the species

Data Quality: Very indirect information

Field Studies: Unaware of specific efforts

Threats: Human interference and hybridization

Concerns/Comments: The estimated global population probably is more than 100,000 individuals, but there virtually are no data on numbers for most subspecies. This species is solitary, and nothing else is known about its social system. Jungle cats may be hybridizing with domestic cats, but no scientific data are available. Because these remaining subspecies are in the "safe" category, a major issue to be addressed is if a captive breeding program is necessary. Eventually this will be based on if true subspecies exist. Based on lack of animals held in Asian zoos, live animals or skins on the animal market, this species warrants further attention to assess status. A priority would be to survey protected areas in range countries to determine presence or absence.

Recommendations:

Research/Management: Survey of wild population status and taxonomy to determine subspecies uniqueness.

Captive Program: Establish a small nuclear population within 5 to 7 years and maintain a target level of genetic diversity by importing a few animals (and genetic materials [sperm/embryos]) from the wild.

PHVA: Not required.

Captive Population: For *prateri*, 5 individuals; for generic, 68 individuals

***Lynx lynx: dinniki, isabellina, kozlovi, lynx, sardinaie, stroganovi, wrangeli* (Lynx spp.)**

Status: Mace-Lande: Safe
CITES: Appendix II
USFWS: Unlisted

Distribution: Western Europe, the former U.S.S.R., Scandinavia, Asia Minor, Iran and Iraq, Mongolia, Manchuria and the mountainous regions of Soviet central Asia

Population: For *Lynx lynx isabellina*, >10,000; for *Lynx lynx kozlovi, >10,000; for* generics, >10,000

Data Quality: Very indirect information

Field Studies: Numerous (see Foreman's bibliography*)

Threats: Unknown

Comments/concerns: This species is represented by a widespread and large-sized, free-ranging population. The lynx prefers a forested area with plenty of dense undergrowth and cover. However, it is an adaptable cat and can live in rocky areas, open forests and even scrub and brushy areas. The Eurasian lynx recently has been reintroduced into parts of Germany, Yugoslavia, Switzerland, Italy and Austria. It is not clear what the taxonomic relationship is between *Lynx lynx* and *Lynx canadensis*.

Recommendations:

Research/Management: Taxonomy to explore issue of species uniqueness with respect to *Lynx canadensis*.

Captive Program: None, but maintain a nuclear population in Europe. Specifically, there is a need to address the issue that this space is more valuable for other felid species.

PHVA: Not required.

Captive Population: For *Lynx lynx lynx*, 34 individuals; for *Lynx lynx wrangeli*, 47 individuals; for generic, 44 individuals

***Lynx canadensis: canadensis, subolanus* (Canadian lynx spp.)**

Status: Mace-Lande: Safe
CITES: Appendix II
USFWS: Unlisted

Distribution: Canada and Alaska

Population: >100,000 for the species

Data Quality: indirect information

Field Studies: See Foreman's bibliography*

Threats: Unknown

Concerns/Comments: This species is represented by a large free-living population. Lynx are found mainly in boreal forests, but they can live in farmland if it is interspersed with heavily wooded areas. It is not clear if Lynx canadensis is a separate species or subspecies of Lynx lynx. This species has been proposed for threatened or endangered status in the United States several times but it has not been approved.

Recommendations:

Research/Management: Taxonomic studies.

Captive Program: None, but maintain a small nucleus population in North America.

PHVA: Not required.

Captive Population: For *subolanus*, 4 individuals; for generics, 73 individuals

***Lynx rufus: bailey, californicus, fasciatus, floridanus, gigas, oaxacensis, pallescens, peninsularis, rufus, superiorensis, texensis* (Bobcat spp.)**

Status: Mace-Lande: Safe
CITES: Appendix II
USFWS: Unlisted

Distribution: Southern Canada to central Mexico

Population: For *fasciatus*, >100; for *floridanus*, 10,000 - 100,000; for *gigas*, >100; for *oaxacensis*, >100; for *pallescens*, >1,000-10,000; for *peninsularis*, >100; for *rufus*, >1,000; for *superiorensis*, >1,000; for *texensis, >10,000;* for all other subspecies, unknown

Data Quality: Indirect information

Field Studies: Numerous (see Foreman's bibliography*)

Threats: Unknown

Concerns/Comments: This species is represented by a large, free-living population. It thrives in a wide variety of habitats including coniferous and hardwood forests, brush and even deserts. Bobcat numbers have been reduced substantially from some mid-western and Northeastern states in the U.S.A.

Recommendations:

Research/Management: Taxonomy

Captive Program: None, but maintain a small, nucleus population in North America.

PHVA: Not required.

Captive Population: 48 total individuals of above subspecies; for generic, 136 individuals

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SECTION 7

SPREADSHEET AND TAXON DATA SHEETS FOR UNKNOWN/ENDANGERED FELID TAXA

Table 10. **UNKNOWN/EXTINCT FELID TAXA**

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
7	Felis	bengalensis borneoensis	Borneo	?					?	?	NO	S,M,T,H	0		LEV 2
17	Felis	bieti bieti	Central China						?						
37	Felis	concolor Puma	N. America, S. America	?			S		?	L	No	T,M	234	1	N
147	Felis (Profelis)	temmincki Asian golden cat	S.E. Asia						?	L,I			23		
156	Felis (Prionailurus)	viverrinus Fishing cat	S.E. Asia			YES			?		P	T,S,M	60	1	LEV 2
173	Felis	yagouaroundi ameghino	N. Argentina	?					?	I,L,Lf,Hp	NO	T,S,H			LEV 2
183	Lynx (Caracal)	caracal	Africa,MidEast, Saudi Arabia, India	<100,000	4		S		?	H	YES	T	113	1	N
193	Lynx	lynx (Eurasian lynx)	Europe, MidEast, Asia	>10,000 ?	5	YES			?	?	NO	T	44	1	N
226	Panthera	leo (African Lion)	Africa						?		YES				
244	Panthera	pardus Leopard	Africa, Asia						?				184	1	N
64	Felis	concolor schorgeri	Central N. America	0	4	?	?		EXT	L,I	NO	T,M	0		
85	Felis	margarita scheffeli	Pakistan	Extinct	4	YES	D		EXT	T	YES	T,S,H	<5	2	N

113	Felis	serval constantina		Extinct					EXT		NO				
230	Panthera	leo leo		Extinct					EXT		YES?				
231	Panthera	leo melanchaita		Extinct					EXT		YES?				
255	Panthera	pardus jarvesi	Sinai	Extinct		NO	D		EXT	H,L	NO	S	0		N
275	Panthera	tigris balica		Extinct					EXT						
277	Panthera	tigris sondaica		Extinct					EXT						
280	Panthera	tigris virgata		Extinct					EXT						

***Felis margarita scheffeli* (Sand cat)**

Status: Mace-Lande: Extinct
CITES: Appendix II
USFWS: Endangered
Distribution: Pakistan
Population: Extinct
Data Quality: Indirect information
Field Studies: Unaware of specific efforts
Threats: Trade
Concerns/Comments: *F.m. scheffieli* may be extinct in the wild. The taxonomy of all 4 subspecies of *F. margarita* needs to be evaluated. An international studbook is in place for *scheffeli*, *harrisonfi* and *scheffeli x harrisonfi*. There is a need to determine if the wild populations are sufficiently healthy to allow some animals to be taken into captivity. It may be possible to import gametes or embryos along with animals.
Recommendations:
Research/Management: Survey to address issue of extinction in the wild, taxonomy to determine subspecies uniqueness and impact of hybridization and husbandry to enhance captive propagation.
Captive Program: Not recommended at this time.
PHVA: Required.
Captive Population: Fewer than 5 individuals

***Panthera pardus jarvisi* (Sinai leopard)**

Status: Mace-Lande: Extinct
CITES: Appendix I
USFWS: Endangered
Distribution: Sinai
Population: Extinct
Data Quality:
Field Studies: Unaware of specific efforts
Threats: Hunting and loss of habitat
Concerns/Comments: The estimated global population is fewer than 10 individuals and declining. This may not be a valid taxon and is possibly extinct.
Recommendations:
Research/Management: Survey to address extinction issue. No need to address taxonomy at this time.
Captive Program: None recommended at the present time.
PHVA: Not required.
Captive Population: 0 individuals

FELID
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
AND
GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

SECTION 8

SPREADSHEET FOR ALL FELID TAXA

Table 11. **All Taxa Table**

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
1	Felis (Profelis)	aurata African golden cat	West and East Africa						V		NO		11		N
2	Felis (Profelis)	aurata aurata (=cottoni)	Uganda, Congo, Kenya	100,000?	4	YES	D		V	L	NO	T,S,H	2		N
3	Felis	aurata celidogaster	West Africa	50,000?	4	YES	D		V	L	NO	T,S,H	2		N
4	Felis (Pardofelis)	badia Bay cat	Borneo	<50??	5	YES	D		C	L	P	T,S	0		P
5	Felis (Prionalilurus)	bengalensis Leopard cat	Asia	1,000,000	4	YES	D		S	H,I,L	NO	T,S,H,M	32		LEV 2
6	Felis	bengalensis bengalensis	India, SE Asia to Yunan	?		YES	D		E	?	NO	T,S,H	22??		LEV 2
7	Felis	bengalensis borneoensis	Borneo	?					?	?	NO	S,M,T,H	0		LEV 2
8	Felis	bengalensis chinensis	China and Formosa	?					V	?	NO	S,T	23		LEV 2
9	Felis	bengalensis euptilura	E. Siberia, Korea	?					V	?	NO	S,T	98		LEV 2
10	Felis	bengalensis horsfieldi	India, Kashmir	?					V	?	NO	S,T			LEV 2
11	Felis	bengalensis javanensis	Java, Bali	?			D		V	?	NO	T,S,H,M	0		LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
12	Felis	bengalensis manchurica Leopard cat	Manchuria, Mongolia	?					V	?	NO	S,T	0		LEV 2
13	Felis	bengalensis minutus	Palawan, Philippines				D		V		NO	T,S,H,M	0		LEV 2
14	Felis	bengalensis sumatranus	Sumatra				D		V		NO	T,S,H,M	0		LEV 2
15	Felis	bengalensis travallani	Kashmir, S. Pakistan	?					V	?	NO	S,T	0		LEV 2
16	Felis	bieti Chinese desert cat	W. Central China	>10,000	5	FRG	?		E?	H,I	NO	T,S	0		LEV 1
17	Felis	bieti bieti	Central China						?						
18	Felis	bieti chutuchta	S. Mongolia	?			D		E?	T,Hp	NO	S,T	?		N
19	Felis	bieti vellerosa	N.E. Shensi, China	?			D		E?	T,Hp	NO	S,T	?		N
20	Felis	chaus Jungle cat	Europe, Africa, Asia	>100,000	5	FRG	?		S	I,Hyb	NO	T,S	118	1	LEV 2
21	Felis	chaus affinis	Kashmir to Yunan						S	I,Hyb	NO	T,S			LEV 2
22	Felis	chaus chaus	Turkistan to Iran, Pakistan						S	I,Hyb	NO	T,S			LEV 2
23	Felis	chaus fulvidina	Assam to Thailand						S	I,Hyb	NO	T,S			LEV 2
24	Felis	chaus furax	Middle East						S	I,Hyb	NO	T,S			LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
25	Felis	chaus kelaarti	Sri Lanka, S. India						S	I,Hyb	NO	T,S			LEV 2
26	Felis	chaus kutas	N. India						S	I,Hyb	NO	T,S			LEV 2
27	Felis	chaus nilotica	Egypt						S	I,Hyb	NO	T,S			LEV 2
28	Felis	chaus prateri	S.& W. India						S	I,Hyb	NO	T,S	5		LEV 2
29	Felis (Lynchailurus)	colocolo Pampas cat	Peru, Ecuador & southward	>10,000	3	YES	D	G	E?	L,Lf,I	NO	T,S,H, Lh,M	30	2	LEV 2
30	Felis	colocolo braccata	Central Brazil to N. Argentina	500-1,000	3	YES	D	G	E	Lf,L,I	NO	T,S,H, Lh,M	2	2	LEV 2
31	Felis	colocolo budini	N.W. Argentina						E	Lf,L,I	NO	T,S,H, Lh,M	?	2	LEV 2
32	Felis	colocolo colocolo	C. Chile						E	Lf,L,I	NO	T,S,H, Lh,M	?	2	LEV 2
33	Felis	colocolo crespoi	N.W. Argentina						E	Lf,L,I	NO	T,S,H, Lh,M	?	2	LEV 2
34	Felis	colocolo garleppi (Mtn Pop)	Peru, Ecuador, Chile	<2,000	4	YES	?	F	E	I,Lf,L	YES	T,S,H, Lh,M	<5	2	LEV 1-2
35	Felis	colocolo pajeros	C. Argentina						E						
36	Felis	colocolo thomasi	Ecuador & N. Peru						E						
37	Felis	concolor Puma	N. America, S. America	?			S		?	L	No	T,M	234	1	N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
37a			Brazil	?			S		S	L,Lf,P, H,Ic	No	Lr,S,Hm, H,T,M,Tl	138	1	P
37b			Bolivia	?			S		V	L,Lf,P, H,Ic	No	Lr,S,Hm, H,T,M,Tl	22	1	P
37c			Paraguay	?			S		V	L,Lf,P, H,Ic	No	Lr,S,Hm, H,T,M,Tl	16	1	P
37d			Argentina	?			S		V	L,Lf,P, H,Ic	No	Lr,S,Hm, H,T,M,Tl, Lh	?	1	P
38	Felis	concolor acrocodia	Matto Grosso /Brazil	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5	1	P
39	Felis	concolor anthonyi	S. Venezuela	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5	1	P
40	Felis	concolor aruacanus	C. Chile						V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5	1	P
41	Felis	concolor azteca	S.W. United States, Mexico	>250	4	?	S	AA	V	L,I	NO	T,M	5	1	LEV 2
42	Felis	concolor bangsi	N Colombia Venezuela	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5	1	P
43	Felis	concolor borbensis	C Brazil	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5	1	P
44	Felis	concolor browni	Arizona, Baja	250	4	NO	?	AA-1	V	I,L	NO	T,M	0	1	LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
45	Felis	concolor cabrera	N Argentina	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~30	1	P
46	Felis	concolor californica	N. Baja, California	5,000 - 10,000??	4	YES	?	F	V/S	I,L	NO	T,M	0	1	LEV 2
47	Felis	concolor capricornensis	S.E. Brazil	?		YES	?		V/S?	L,Lf,I, Hp,	NO	Lr,S,Hm, H,T,M,Tl, Lh	~30	1	P
48	Felis	concolor concolor	E. Venezuala, Guinea Highlands	?		YES			V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	35	1	P
49	Felis	concolor coryi	S. Florida	30 - 50	1	YES	D	AA-1	C	Pu,I,G, D	Com-pleted	M,H	11	2	LEV 1
50	Felis	concolor costraricensis	Nicaragua to Panama	500	4	YES	D		V?/ E?	L,I,H, Lf	YES	T,S,M	~30	1	N
51	Felis	concolor cougar	Eastern N. America	?	4	YES	E		V	L,I	NO	T,M	0		LEV 2
52	Felis	concolor greeni	E. Brazil	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~10		P
53	Felis	concolor hippolestes	Wyoming, Utah, Montana	1,000 - 2,500??	4	?	S		V	L,I	NO	T,M	14		LEV 2
54	Felis	concolor improcera	S. Baja Peninsula	?	4	?	?	AA-1	V	L,I	NO	T,M	1	1	LEV 2
55	Felis	concolor incarum	Peru	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5		P

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
56	Felis	concolor kaibabensis	N. Arizona, S. Utah	>5,000	4	?	S	E	V	L,I	NO	T,M	3		LEV 2
57	Felis	concolor mayensis	S. Mexico, Honduras	1000	4	YES	D		V/E?	L,I,H, Lf	YES	T,S,M	50		N
58	Felis	concolor missoulensis	Alberta, Montana	>10,000	4	?	S	G	V/S	L,I	NO	T,M	8		LEV 2
59	Felis	concolor oregonensis	Washington Oregon, British Columbia	>10,000	4	?	S	G	V/S	L,I	NO	T,M	6		LEV 2
60	Felis	concolor osgoodi	Bolivia	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~5		P
61	Felis	concolor patagonica	S.Chile	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~3		P
62	Felis	concolor pearsoni	S. Argentina	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~10		P
63	Felis	concolor puma	N. Chile Argentina	?		YES	?		V/S?	L,Lf,I, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~20		P
64	Felis	concolor schorgeri	Central N. America	0	4	?	?		EXT	L,I	NO	T,M	0		
65	Felis	concolor soderstromii	Colombia, Ecuador	?		YES	?		V/S?	L,I,Lf, Hp	NO	Lr,S,Hm, H,T,M,Tl, Lh	~10		P
66	Felis	concolor stanleyana	W. Texas New Mexico	300 - 500	4	?	S	G	V	L,I	NO	T,M	11	1	LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
67	Felis	concolor vancouverensis	Vancouver Island, British Columbia	< 500	4	?	S+	AA-1	V	L	NO	T	5	1	N
68	Felis (Leopardus)	geoffroyi Geoffroy's cat	Bolivia, Chile, Paraguay, Argentina, Uraguay, Brazil	10,000	2	YES	S	G	V	L,Lf,I, H,T	NO	T,S,M,	~70	2	LEV 2
69	Felis	geoffroyi euxanthis	Bolivia						V						
70	Felis	geoffroyi geoffroyi	S. Argentina, Chile						V				2		
71	Felis	geoffroyi paraguae	Uraguay, N. Argentina, Paraguay, Brazil						V				6		
72	Felis	geoffroyi salinarum	C. Argentina						V				9		
73	Felis (Oncifelis)	guigna													
74	Felis	guigna guigna Kodkod	S. Chile and Patagonia	3,000-5,000?	3& 4	YES	D	C	E?	L,I,Lf	NO	T,S,M,Lh ,Hm	0	3	P?/ LEV 2
75	Felis	guigna tigrillo	C. Chile	3,000-5,000?	3& 4	YES	D	C	E?	L,I,Lf	NO	T,S,M	?	?	P/ LEV 2
76	Felis (Mayailurus)	irimotensis Leopard cat	Irimote Islands, Japan	100	1	NO	D		C	D, Hyb	YES	T,S,M	?	2?	LEV 1

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
77	Felis (Oreailurus)	jacobita Andean Mtn Cat	N. Chile, Peru, Bolivia, Argentina	<1,000	3,4	YES	?	?	C/E	H,I	P	T,S,M,Lh	0	3	P/ LEV 1
78	Felis (Otocolobus)	manul Pallas cat	W. Asia						V						
79	Felis	manul ferrugineus	SW Turkestan Iran, Afganistan	>10,000	5	YES	D		V	L,I,H	NO	T,S,H,M	0	2	LEV 2
80	Felis	manul manul	Mongolia, W. China, Russia	>10,000	5	YES	D		E/V	L,H,Hp	YES	T,S,H	21		LEV 1
81	Felis	manul nigripectus	N.Pakistan, India, Tibet-Nepal	>10,000	5	YES	D		V	L,H,I	NO	T,S,M	2		LEV 2
82	Felis	margarita Sand cat	N. Africa to Turkmenia						E/V				22		
83	Felis	margarita harrisonii	Israel, Arabian Pen	<5,000	4	YES	D		E/V?	H	YES	T,S,H	<10		LEV 1
84	Felis	margarita margarita	N. Africa	<5,000	4	YES	D		E/V?	H	YES	T,S,H	0	2	LEV 1
85	Felis	margarita scheffeli	Pakistan	Extinct	4	YES	D		EXT	T	YES	T,S,H	<5	2	N
86	Felis	margarita thinobia	Turkestan	<1,000	4	YES	D		E/V?	H	YES	T,S,H	0	2	LEV 1
87	Felis (Pardofelis)	marmorata Marbled cat	Asia						E/V		YES	H,S,M,T	3		
88	Felis	marmorata charltoni	Nepal to Burma, S. Tibet	<5,000	5	YES	D		E/V	L,H,I	YES	T,S,H,M	4	?	LEV 1

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
89	Felis	marmorata marmorata	Thailand, Malaysia, Borneo, Sumatra	<5,000	5	YES	D		E/V	L,H,I	YES	T,S,H,M	2		LEV 1
90	Felis	nigripes Black-footed cat	Botswana, Namibia, S.Africa			2			E	L	YES		54	2	N
91	Felis	nigripes nigripes	Namibia, South Africa	?		YES	D		E	L	NO	S,M,T,H	27?	2	LEV 1
92	Felis	nigripes thomasi	Eastern Cape Province	?			D		E?	L	NO	T,M,S,H	0	2?	LEV 1
93	Felis (Leopardus)	pardalis Ocelot	C&S America	>10,000	2	YES	D	G	V	L,I, H,Lf, T(fur)	YES	T,S,H	400-500	2	LEV 2
94	Felis	pardalis aequatorialis	N. Andes		2				V	L,Lf,I,T	YES	S,T			LEV 2
95	Felis	pardalis albescens	Texas, NE Mexico	<100	2	NO	D	?	C	H,I,L	YES	T,M, Hm	0	2	LEV 1
96	Felis	pardalis maripensis	Guiana Highlands		2				V	L,Lf,I,T	YES	S,T			LEV 2
97	Felis	pardalis mearnsi	Nicaragua to Panama		2				V	L,Lf,I,T	YES	T,S	1		LEV 2
98	Felis	pardalis mitis	C. Brazil & N. Argentina, Paraguay	2,500?	2				E	L,Lf,H,I	YES	T,H,S,M, Lh	30		LEV 2
99	Felis	pardalis nelsoni	Coast of C. Mexico		2				V	L,Lf,I,T	YES	T,S			LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
100	Felis	pardalis pardalis	S.E. Mexico-Honduras		2				V	L,Lf,I,T	YES	T,S	1		LEV 2
101	Felis	pardalis pseudopardalis	N. Colombia, W. Venezuala	?	2	?	?		V	L,Lf,I,T	YES	T,S	3		LEV 2
102	Felis	pardalis pusaeus	S.W. Ecuador, Peru coast		2				V	L,Lf,I,T	YES	T,S	1		LEV 2
103	Felis	pardalis sonorensis	N.W. Mexico, Arizona		2				V	L,Lf,I,T	YES	T,S			LEV 2
104	Felis	pardalis steinbachi	Central Bolivia		2				V	L,Lf,I,T	YES	T,S			LEV 2
105	Felis (Prionailurus)	planiceps Flat-headed cat	Malaysia, Indonesia, Borneo, Thailand	>10,000	5	YES	D		E/V?	?	NO	T,S,H,M	0	?	LEV 2
106	Felis (Prionailurus)	rubiginosa Rusty-spotted cat	India, Sri Lanka						E/V	L,Lf,I,T	YES				LEV 1
107	Felis	rubiginosa phillipsi	Sri Lanka	1,000	4	YES	D		E	?	P	T,S,H,M	21		LEV 1
108	Felis	rubiginosa rubiginosa	S. India	>1,000	4	YES	D		E	?	P	T,S,H,M	0		LEV 2
109	Felis (Leptailurus)	serval	Africa						S						
110	Felis	serval serval	S.E. Africa	< 100,000	4	15	D?		S	H	NO	T	194	1	LEV 2
111	Felis	serval beirae (= serval)			4				S	H	NO	T			

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
112	Felis	serval brachyura	Senegal to Ethiopia		4				S	H	NO	T			
113	Felis	serval constantina		Extinct					EXT		NO				
114	Felis	serval hamiltoni (=serval)			4				S	H	NO	T			
115	Felis	serval liptosticta	E-C Africa		4				S	H	NO	T	4		
116	Felis	serval ingridi (=serval)			4				S	H	NO	T	8		
117	Felis	serval kempi (=serval)			4				S	H	NO	T	1		
118	Felis	serval kivuensis (=liptosticta)			4				S	H	NO	T			
119	Felis	serval limpopooensis (=serval)			4				S	H	NO	T			
120	Felis	serval lonnbergi (=serval)			4				S	H	NO	T			
121	Felis	serval phillipsi	Sudan		4				S	H	NO	T			
122	Felis	serval togoensis	Togo and Dahomey		4				S	H	NO	T			
123	Felis	silvestris (African Wildcat)	Africa, Europe, Asia	>100,000	4	D			V?	Hyb	NO	T,S	6	1	N
124	Felis	silvestris brockmani	Somalia		4	D			V?	Hyb	NO	T,S			

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
125	Felis	silvestris cafra	Southern Africa		4	D			V?	Hyb	NO	T,S			
126	Felis	silvestris caucasica	N. Iran, Caucuses						V?	Hyb	NO	T,S	1		LEV 2
127	Felis	silvestris caudata	Turkey to Mongolia						V?	Hyb	NO	T,S			LEV 2
128	Felis	silvestris chutuchta	Gobi						V?	Hyb	NO	T,S			LEV 2
129	Felis	silvestris cretensis	Crete						V?	Hyb	NO	T,S			LEV 2
130	Felis	silvestris foxi	W. Africa		4				V?	Hyb	NO	T,S			
131	Felis	silvestris grampia (Scth Wildcat)	Scotland	<1,000	4	NO	I	?	C/V?	Hyb	YES	T	3	1	LEV 2
132	Felis	silvestris griselda	Southern Africa						V	Hyb	NO	T,S			
133	Felis	silvestris haussa	West Africa						V	Hyb	NO	T,S			
134	Felis	silvestris iraki (includes gordoni)	Iraq, Arabia	?					E/V?	Hyb	NO	T,S,H	?		LEV 1
135	Felis	silvestris jordansi	Mallorca	?					E/V?	Hyb	NO	T,S,H,G	?		LEV 1
136	Felis	silvestris lybica	North Africa	>500,000	4	YES	D		S?	Hyb	NO	T,S,H	2		LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
137	Felis	silvestris matschiei	Turkmenia						V?	Hyb	NO	T,S			LEV 2
138	Felis	silvestris mellandi	Central Africa						V?	Hyb	NO	T			
139	Felis	sivestris ocreata	Ethiopia						V?	Hyb	NO	T			
140	Felis	silvestris ornata	India to S. Iraq	<500	5	YES	D		E?	H	NO	T,S	6		LEV 1
141	Felis	silvestris reyi	Corsica						V?	Hyb	NO	T,S			LEV 2
142	Felis	silvestris rubida	N.E. Zaire, Congo						V?	Hyb	NO	T,S			
143	Felis	silvestris sarda	Sardinia, Atlas Mtns						V?	Hyb	NO	T,S			LEV 2
144	Felis	silvestris silvestris	Europe	500,000		YES	D		V?	Hyb	NO	T,S	33		LEV 2
145	Felis	silvestris ugandae	East Africa						V?	Hyb	NO	T,S	1		
146	Felis	silvestris vellerosa	Mongolia						V?	Hyb	NO	T,S			LEV 2
147	Felis (Profelis)	temmincki Asian golden cat	S.E. Asia						?	L,I			23		
148	Felis	temmincki dominicanrum	S. & E. China	<5,000	5	YES	D		E	L,I,T	NO	T,S,H,M	0		LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
149	Felis	temmincki temmincki	Nepal to Sumatra	<10,000	5	YES	D		V/E	?	YES	T,S,H,M	3		LEV 1
150	Felis	temmincki tristis	S. China, N. Burma, Tibet	<5,000	5	YES	D		E	L,I,T	NO	T,S,M	0		LEV 2
151	Felis (Leopardus)	tigrina Tiger cat	S. America						E						
152	Felis	tigrina guttula	C. Brazil to N. Argentina	>10,000	3	YES	D	G	V	I,L, Lf,Hp	YES	T,H,S,M, Lh	~75	1	LEV 1
153	Felis	tigrina oncilla	Costa Rica to N.Panama	200-300?	2	YES	D	AA	C	I,L,Lf	YES	T,H,S H,Lh	0	1	LEV 1
154	Felis	tigrina pardinoides	Peru, Colombia, Ecuador, W.Venezuela	2,500	3	YES	D	F	E	I,L,Lf	YES	T,S,H	50	1	LEV 1
155	Felis	tigrina tigrina	Amazon basin and N.E. Brazil	>10,000	3	YES	D	G	V	I,L,Lf, Hp	YES	S,M,T,H, Lh	~20	1	LEV 1
156	Felis (Prionailurus)	viverrinus Fishing cat	S.E. Asia			YES			?		P	T,S,M	60	1	LEV 2
157	Felis	viverrinus rizophoreus	Java	<5,000	5	YES	S		V	?	P	T,S,M	0	1	LEV 2
158	Felis	viverrinus viverrinus	S.E. Asia	<10,000	5	YES	D		V	?	P	T,S,M	60	1	LEV 2
159	Felis (Leopardus)	wiedii Margay	C&S America	>10,000	2	YES	D	G	E	L,Lf,I	YES	T,S,M, Lh,H	200-300	2	LEV 1

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
160	Felis	wiedii amazonica	Amazonia						E				2		
161	Felis	wiedii boliviae	Bolivia to Matto Grossa						E				1		
162	Felis	wiedii cooperi	S.E. Texas-N.E. Mexico						E				0		
163	Felis	wiedii glaucula	W. Mexico						E				7		
164	Felis	wiedii nicaraguae	Hondurus to Costa Rica						E						
165	Felis	wiedii oaxacensis	S/C Mexico						E						
166	Felis	wiedii pirrensis	Panama to Bolivia						E						
167	Felis	wiedii salvinia	S.W. Mexico to El Salvador						E						
168	Felis	wiedii vigens	Guiana Highlands, N. Brazil	>5,000	3	NO	D	G	V	L,Lf,I	YES	H,Lh, S,T,M	<10	3	LEV 3
169	Felis	wiedii weidii	S.E. Brazil, N.E. Argentina, Uruguay	>2,000	3	YES	D	F	E	L,Lf,I	YES	H,Lh, S,M,T	<50	3	LEV 1
170	Felis	wiedii yucatanica	Yucatan and Belize						E						
171	Felis (Herpailurus)	yagouaroundi Jaguarundi	S. US, C&S America	>10,000	3	YES	D	G	V	I,L,Lf, Hp	NO	T,S,H	~200	1	LEV 2 sub pops

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
172	Felis	yagouaroundi cacomitlli	S. Texas, E. Mexico	1000	3& 4	YES	D	F	E	I,L Lf, Hp	NO	T,S,H	1	1	LEV 1
173	Felis	yagouaroundi ameghino	N. Argentina	?					?	I,L,Lf, Hp	NO	T,S,H			LEV 2
174	Felis	yagouaroundi eyra	S. Brazil, N. Argentina	10,000	3,4	YES	S	G	V	I,L,Lf, Hp	NO	T,S,H	?	2	LEV 2
175	Felis	yagouaroundi fossata	S. Mexico, N. Nicaragua	<1,000	3,4	YES	D	B	E	Hp,L, Lf,I		T,S,H	7	2	LEV 2
176	Felis	yagouaroundi melantho	Peru	?					V	Hp,L, Lf,I	NO	T,S,H			LEV 2
177	Felis	yagouaroundi panamensis	S. Nicaragua, Ecuador	500-1,000	3,4	YES	D	?	E	Hp,L, Lf,I,W	NO	T,S,H	?	2	LEV 2
178	Felis	yagouaroundi tolteca	W. Mexico to Arizona	?					E	I,L,Lf, Hp	NO	T,S,H	?		LEV 2
179	Felis	yagouaroundi yagouaroundi	Guiana Highlands	>5,000	3,4	YES	D	G	V	Hp,L, Lf,I	NO	T,S,H	?	?	LEV 2
180	Lynx	canadensis Canadian lynx	North America	>100,000	4	?	S	G	S	?	NO	T	73	1	N
181	Lynx	canadensis canadensis	Alaska, Canada, N. United States				D		S	?	NO	T			N
182	Lynx	canadensis subolanus	Newfoundland				?		S	?	NO	T	4		N
183	Lynx (Caracal)	caracal	Africa,MidEast, Saudi Arabia, India	<100,000	4		S		?	H	YES	T	113	1	N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
184	Lynx	caracal algirus	N. Africa		4				S	H	NO	T			LEV 2
185	Lynx	caracal caracal	East Africa		4	YES	D		S	H	YES	T	9		LEV 2
186	Lynx	caracal damarensis	S.W Africa		4		D		S	H	NO	T	27		LEV 2
187	Lynx	caracal limpopoensis	S.C. Africa		4				S	H	NO	T			LEV 2
188	Lynx	caracal lucani	N.W. Angola & Gabon		4				S	H	NO	T			LEV 2
189	Lynx	caracal michaelis	Turkmenia	<500	5	YES	D		C	L	YES	S,T	10	1	N
190	Lynx	caracal nubicus	E. Africa						S	H	NO	T			LEV 2
191	Lynx	caracal poecilotis	W. Africa						S	H	NO	T	4	1	LEV 2
192	Lynx	caracal schmitzi	Arabia and C. India	<500?	5	YES	D		C	L,H	YES	S,T	3	1	N
193	Lynx	lynx (Eurasian lynx)	Europe, MidEast, Asia	>10,000?	5	YES			?	?	NO	T	44	1	N
194	Lynx	lynx dinniki	N. Caucuses and Iraq	?	5				S	?	NO	T			N
195	Lynx	lynx isabellina	Kashmir, C. Russia, Mongolia	>10,000?	5	YES			S	?	NO	T			N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
196	Lynx	lynx kozlovi	C. Siberia	>10,000?	5	YES			S	?	NO	T			N
197	Lynx	lynx lynx	Europe	?	5				S	?	NO	T	34		N
198	Lynx	lynx sardiniae	Sardinia	?	5				S	?	NO	T			N
199	Lynx	lynx stroganovi	Coastal Siberia, Korea, Mancheria	?	5				S	?	NO	T			N
200	Lynx	lynx wrangeli	N.E. Siberia	?	5				S	?	NO	T	47		N
201	Lynx	pardinus (spanish lynx)	Spain, Portugal	<1,000	2	YES	D	?	C	?	YES	S	3		LEV 1
202	Lynx	rufus (bobcat)	S. Canada-C. Mexico						S		NO	T	136	1	N
203	Lynx	rufus bailey	S.E. California to Kansas, Central Mexico				S		S	?	NO	T	2		N
204	Lynx	rufus californicus	California				S		S	?	NO	T	4		N
205	Lynx	rufus escuinapae	N. Mexico	?		?	?		V	?	YES	T	7		N
206	Lynx	rufus fasciatus	S. Canada	>100			S		S	?	NO	T	2		N
207	Lynx	rufus floridanus	S.E. United States	10,000-100,000			S		S	?	NO	T	11		N
208	Lynx	rufus gigas	Maine and Canada	>100			S		S	?	NO	T	1		N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
209	Lynx	rufus oaxacensis	C. Mexico	>100			S		S	?	NO	T	0		N
210	Lynx	rufus pallescens	Rocky Mtns.	>1,000 to 10,000			S		S	?	NO	T	11		N
211	Lynx	rufus peninsularis	Baja	>100			S		S	?	NO	T	0		N
212	Lynx	rufus rufus	New England, C. United States	>1,000			S		S	?	NO	T	10		N
213	Lynx	rufus superiorensis	Upper Midwest	>1,000			S		S	?	NO	T	0		N
214	Lynx	rufus texensis	Texas, N.E. Mexico	>10,000			S		S	?	NO	T	6		N
215	Neofelis	nebulosa Clouded leopard	S.E. Asia	<10,000	4	YES	D		C/E	L,H	YES	H,S,M,T	140	3	LEV 1
216	Neofelis	nebulosa brachyurus	Taiwan				D		C						
217	Neofelis	nebulosa diardi (Subspecies sep unclear)	Sumatra, Borneo				D		C				1		
218	Neofelis	nebulosa macrosceloides	Nepal to Burma				D		E						
219	Neofelis	nebulosa nebulosa	S. China to Malaysia				D		E						
220	Acinonyx	jubatus Cheetah	Africa	10,000-15,000					E		YES	S,H	316	2	LEV 1
221	Acinonyx	jubatus hecki	W. Africa	<500	4		D		E	None	YES	S,H	0		N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
222	Acinonyx	jubatus jubatus	S. Africa	10,000	3	NO	S		V	H	YES	S,M,H	316		N
223	Acinonyx	jubatus raineyi	E. Africa	<1,000	3	NO	D		E	None	YES	S,H	0		N
224	Acinonyx	jubatus sommeringii	Nigeria to Somalia	<2,000	3	NO	D		E	None	YES	S,H	0		N
225	Acinonyx	jubatus venaticus	Iran, Turkmenia	<100	4	NO	D		C		YES	S,T	0		N
226	Panthera	leo (African Lion)	Africa						?		YES				
227	Panthera	leo azandica	N.E. Congo	?	4		D		V	L,H	YES	S,M,T	0		N
228	Panthera	leo bleyenberghi	Angola, Namibia, W. Zimbabwa	<1,000	4	YES	D		V	L,H	YES	S,M,T	0		N
229	Panthera	leo krugeri	Southern Africa	<10,000	3	YES	D		V	L,H,D	YES	T,S,M	24		LEV 1
230	Panthera	leo leo		Extinct					EXT		YES?				
231	Panthera	leo melanchaita		Extinct					EXT		YES?				
232	Panthera	leo nubica	East Africa	10,000	3	YES	D		V	D,H,L	YES	T,S,M	8		LEV 2
233	Panthera	leo persica	Gir Forest, India	<300	1	NO	S		C	D,I,H, II,L	NO	H,O	65?	1	LEV 1
234	Panthera	leo senegalensis	Senegal	<1,000??	4	YES	D		E	L,H	YES	T,S	0		LEV 2

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
235	Panthera	onca Jaguar	C&S America	>10,000		YES	D		E	Lf,I	YES	T,S	3,000		LEV 1
236	Panthera	onca arizonensis	N.W. Mexico	<500	4	YES	D	C	C	H,I,L Lf	YES	Hm,T,S	<10	1	LEV 1
237	Panthera	onca centralis	C. America Colombia, Ecuador	1000	4	YES	D	F	E	H,I,L Lf	YES	Hm,T,S	100	1	LEV 1
238	Panthera	onca goldmani	Yucatan, Belize, Guatemala	1000	4	YES	D	F	E	H,I,L Lf	YES	Hm,T,S	20	1	LEV 1
239	Panthera	onca hernandesii	Mexico	<500	4	YES	D	C	C	H,I,L Lf	YES	T,S, Hm	40	1	LEV 1
240	Panthera	onca onca	Venezuela, Brazil, Guyana	10,000	2	YES	S	G	E	H,I,L Lf	YES	T,S, Hm	~200	1	LEV 1
240a			Bolivia	2,000		YES	I		E	H,Ic,L, Lf,T	YES	M,H,Hm, G,Tl,Lh			
240b			Paraguay	150-200		YES	S		E	H,Ic,L, Lf,T	YES	M,H,Hm, G,Tl,Lh			
240c			Brazil	~10,000 (onca+ palustris)		YES	D		C	G,Ht,I, L,Lf,Po T(skin)	P	T,Tl,S, M,H,Hm, Lm,Lr			
240d			Argentina			YES	D		E	H,Ic,L, Lf,T	YES	T,Tl,S, M,H,Hm, Lh,Lr			
241	Panthera	onca palustris	Brazil, Argent., Urug.,Parag., Bolivia	5,000	2	YES	D	G	E	H,I,L Lf	YES	T,S, Hm	50	1	LEV 1

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
241a			Bolivia	1,000		1	I		E	H,Ic,L, Lf,T	YES	M,H,Hm, G,Tl,Lh			
241b			Paraguay	350		YES	S		E	H,Ic,L, Lf,T	YES	M,H,Hm, G,Tl,Lh			
241c			Brazil	~10,000 (onca+ palustris)		YES	D		V/E	G,Ht,I, L,Lf,Po T(skin)	P	T,Tl,S,M, Hm, Lm,Lr,Lh			
241d			Argentina			YES	D		E	H,Ic,L, Lf,T	YES				
242	Panthera	onca peruvianus	Ecuador, Peru	<500	4	YES	D	C	C	H,I,L Lf	YES	T,S, Hm	<10	1	LEV 1
243	Panthera	onca veraecruscis	E. Mexico	<500	4	YES	D	C	C	H,I,L Lf	YES	T,S, Hm	<10	1	LEV 1
244	Panthera	pardus Leopard	Africa, Asia						?				184	1	N
245	Panthera	pardus adersi	Zanzibar	<50	4	NO	D		C	H,L	YES	T,S	0		N
246	Panthera	pardus adusta	Ethiopia	5,000	3	YES	I		S	H	YES	S,T	0		N
247	Panthera	pardus chui	W. Kenya, Uganda	5,000	3	YES	I		S	H	YES	S,T	0		N
248	Panthera	pardus ciscaucasia	Russia Caucusus	<25	5	YES	D		C	H,L	NO	T,S	0		N
249	Panthera	pardus dathei	S. Iran, S.W. Afganistan	<500	5	YES	D		C	L,H	YES	S,T	0		N

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
250	Panthera	pardus delacouri	S.E.Asia	<5,000	4	YES	D		V	L,H	NO	T,S	15		N
251	Panthera	pardus fusca	India	10,000	4	YES	D		V	H,L	NO	S	3		N
252	Panthera	pardus ituriensis	Zaire	>100,000	3	NO	S		S	None	YES	S,T	0		N
253	Panthera	pardus kotiya	Sri Lanka	<250	3	YES	D		C	L	YES	T,S	40		LEV 1
254	Panthera	pardus japonensis	China	<5,000	4	YES	D RPID		E	?	NO	T,S	100		LEV 2
255	Panthera	pardus jarvesi	Sinai	Extinct		NO	D		EXT	H,L	NO	S	0		N
256	Panthera	pardus leopardus	West Africa	<10,000	4	YES	D		V	H,L	YES	T,S	1		N
257	Panthera	pardus melanotica	Cape Africa	<500	3	YES	D		S	H	YES	T,S	8		N
258	Panthera	pardus melas	Java	<500	2	YES	S		E	H,L	NO	T,S	8		N
259	Panthera	pardus millardi	Nepal	<2,000	4	YES	D		V	H,L	NO	T,S	0		N
260	Panthera	pardus nannopardus	Somalia	<100 (poss. ext.)	4	YES	D		C	Po	YES	S	0		N
261	Panthera	pardus nimr	Israel, Jordan, Arabia	<100	3	YES	D		C	D	YES	S,T	6		N
262	Panthera	pardus orientalis	Siberia, N. Korea, Manchuria	<100	3	YES	D		C	H	NO	T,S,M	136		LEV 1

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
263	Panthera	pardus panthera	Morocco	<20	3	NO	D		C	L,H	YES	S	0		N
264	Panthera	pardus pardus	Lower Egypt, Upper Sudan	<1,000			D		E	H,L	YES	S,T	0		N
265	Panthera	pardus pernigra	Bhutan	<2,000	4		D		V	H,L	NO	S,T	1		N
266	Panthera	pardus reichenowi	Cameroon	<5,000	4	YES	D		V	H,L	YES	T,S	0		N
267	Panthera	pardus saxicolor	N. Iran, W. Afganistan, Turkmenia	<500	5	YES	D		E	H,L	NO	T,S,M	129		EEP LEV 1
268	Panthera	pardus shortridgei	Southern Africa	<100,000	3	YES	D		V	H,L	YES	S,T	Some		N
269	Panthera	pardus sindica	S. Pakistan, E. Afganistan	<500	5	YES	D		E	H,L	NO	T,S,M	1		N
270	Panthera	pardus suahelica	E. Africa	50,000	3	YES	S		S	H,Po	YES	S,T	0		N
271	Panthera	pardus tulliana	Lebanon, Syria, Iraq, Turkey	<25	4	YES	D		C	H,L	NO	S,T	0		N
272	Panthera	tigris (no subspecies) Tiger													
273	Panthera	tigris altaica	Siberia	<250	2	YES	D RPD		C	L,Lf,H	YES	T,S,M	711	1	LEV 1
274	Panthera	tigris amoyensis	S. China	40	3	YES	D		C	L,Lf	YES	T,S,M	52	1	LEV 1
275	Panthera	tigris balica		Extinct					EXT						

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	NUM	DIFF	REC
276	Panthera	tigris corbetti	S.E. Asia	<2,000	4	YES	D		E	L,Lf,H	YES	T,M	14	1	LEV 1
277	Panthera	tigris sondaica		Extinct					EXT						
278	Panthera	tigris sumatrae	Sumatra	400-500	2	YES	STBL		C	L,Lf,H	Com-pleted	T,S,M	235	1	LEV 1
279	Panthera	tigris tigris	India	<3,500	4	YES	D		E	I,H	YES	T,M	145	1	LEV 1
280	Panthera	tigris virgata		Extinct					EXT						
281	Panthera	unica	Central Asia	5,000-7,000	1	YES	D		E/V	I,H	YES	M,T	450	1	LEV 1

FELID
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
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GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

SECTION 9

GLOBAL CAPTIVE ACTION RECOMMNEDATIONS

Global Captive Action Recommendations (GCARs):

The second evaluation component to the felid workshop in Virginia involved making global captive action recommendations (GCAR). GCARs are derived from the CAMP process. The CAMP recommends which species/subspecies deserve attention and the GCAR determines the target number of animals necessary to sustain a healthy captive global population. This system assumes that captive populations be treated as an integral part of the metapopulations being managed by conservation strategies and action plans. Viable metapopulations may need to include captive components. The IUCN Policy Statement on Captive Breeding recommends, in general, that captive propagation programs be a component of conservation strategies for taxa in which the wild population is fewer than 1,000 individuals. Captive and wild populations should and can be intensively and interactively managed with interchanges of animals occurring as needed and as feasible, after appropriate analysis. There may be problems with interchanges including epidemiologic risks, logistic difficulties and financial limitations. However, limited but growing experience suggests that these problems can be resolved. Strategies and priorities should maximize options while minimizing regrets for species conservation.

The focus of the GCAR is on captive propagation programs that can serve as genetic and demographic reservoirs to support future survival and recovery of wild populations. The GCAR workshop provides strategic guidance for captive programs at both the global and regional level. GCAR workshop activities include considering how the various regional programs for each taxonomic group might interact and combine to catalyze a truly effective global effort. One important aspect is establishing global target population size goals (i.e., how many individuals ultimately to maintain). A GCAR also confirms the recommendations made by the CAMP process:

1. which taxa in captivity should remain there.
2. which taxa not yet in captivity should be there.
3. which taxa currently in captivity should no longer be maintained there.

There are multiple genetic and demographic objectives affecting the captive population target; some taxa require large population sizes for a long time, whereas others need small nuclei or gene pools that can be expanded later, if needed. One result of the GCAR is to provide logical advise on adjusting current captive population sizes in various regions, to better sustain threatened taxa as well as to identify new space available for conserving other species/subspecies.

In summary, the GCAR provides the strategic framework for establishing global target number priorities. This information, in turn, can be used by all regional taxon advisory groups to formulate, coordinate and implement effective Regional Collection Plans that together can have a true global conservation impact.

GCAR workshop goals. The goals of the Felid GCAR were:

1. To review CAMP data, confirm captive recommendations and discuss any required changes to those recommendations.

2. To prioritize taxa in need of captive management and to identify global target population sizes.

3. To compare current regional collection plans with the global conservation priorities identified by the GCAR process.

The GCAR process. The GCAR process begins by compiling as much background information as possible on the status of taxa in the wild and in captivity. For this purpose, CBSG utilizes information from Action Plans that may have been formulated by taxonomic Specialist Groups of the SSC. When such plans do not exist, CBSG collaborates with the appropriate Specialist Group to produce the necessary data that will allow the GCAR to proceed. In most cases, the priorities and program goals determined by the CAMP process, as well as the number of individuals in captivity and the degree of experience and difficulty of captive management for each taxon, are available in the CAMP document. A current census of captive animals found in ISIS abstracts and TAG reports, studbooks and regional inventories also is useful. A major consideration in establishing priority species for captive management is the Mace-Lande Criteria of threat assigned during the CAMP process (see above).

The Felid GCAR process involved (and will further involve in the future) considering all these relevant data in intensive and interactive discussion involving experts representing the various organized regions of the zoo world. The objectives are systematic decision-making, captive program prioritization, initial selection of global species target population sizes and identification of regional distribution of each taxon. This is followed by determining which species/subspecies and the estimated number of individual animals that should be included in captivity globally.

Target population sizes can be computed using the computer program CAPACITY 3.0 (Ballou, 1992). The CAMP and GCAR processes attempt to achieve a goal of maintaining 90% of the original founder's heterozygosity for 100 years. Other program parameters that are manipulated include:

1. generation length.
2. annual growth rate of the population (lambda).
3. size of the current captive population (N) and the effective population size (Ne).
4. the estimated Ne/N ratio.
5. percentage diversity retained to date.
6. current year.

General steps for computing global target population numbers using Ballou's CAPACITY Program 3.0 are as follows:

1. Calculate the N by assessing the total number of individuals in captivity (from the ISIS TAG reports).
2. Estimate the generation length by determining the median between the earliest age of reproduction and oldest age for reproduction, adjusting for decreasing reproduction with

increasing age, if applicable.
3. Determine the crude 'lambda' value (the projected growth rate of the population under ideal conditions). If no better data are available, lambda can be estimated as the crude rate of change (CRC) found in the ISIS TAG report. When the CRC value is less than 1.0, it is necessary to artificially increase lambda to 1.1.
4. Determine the Ne (effective population size) as the number of living breeders (LivBr) taken from the ISIS TAG report, unless more accurate data are available.
5. Calculate the Ne/N (effective population divided by the total population) by dividing the number of living breeders by the total number in captivity.
6. Consider 100% diversity at the onset of the program and the current year as 0 unless the population has been in captivity for a period of time and the loss of genetic diversity is known.
7. Using the above parameters, the target populations are computed. All world target numbers are based on a 100 year management program with 90% retention of heterozygosity.
8. In some cases, it may be necessary to modify one or more variables to achieve the program goals. For example, the number of available animals may be too few to establish a viable program, and it will be necessary to plan to import new founders into the management program. This can be determined by adjusting the variable of effective population size.
9. Where more accurate information is available (from current international studbooks, for example), those data should be used in place of ISIS values.
10. It in imperative that all details involving the computation of global target populations be documented and included in the final GCAR report.

These steps were used to estimate global population size recommendations for each of the felid species/subspecies recommended for captivity (Table 12). The assumptions used for generating target values for small cat species/subspecies differed slightly from those used for large cats. The current convention for projecting the necessary captive carrying capacity for small felids (as well as large) is based upon retaining for 100 years 90% of heterozygosity present in the current wild population. When the calculations begin with the founder stock available in captivity, results indicate that unrealistic numbers (400-1000) of many small cat species need to be managed in a captive situation worldwide. Small cats have never been successfully managed in large numbers in captive populations for prolonged periods. Four strategies were suggested for consideration when developing a program to reduce the number of live animals per taxon needing to be maintained in captivity for conservation purposes. The four strategies are:
1. Using a Genome Resource Bank (GRB) with semen from founders to allow periodic reinfusion of founder genetic material into the population to restore and maintain genetic variation (>90% heterozygosity for 100 years) and to effectively extend generation time. In a population of about 80 animals, this could be accomplished by one to two artificial inseminations per generation from the GRB to produce 4 offspring per species.
2. Securing additional animals from the wild population to provide sufficient numbers of founders for the captive population to reduce population size required to maintain the 90%

heterozygosity for 100 years target. The total number of effective founders required for this situation is in the range of 20 to 30 breeding animals.

3. Planning a systematic program for periodic additions of wild animals (one or two per generation) to the captive population to provide occasional gene flow from the wild to the captive population. This would allow continuing the 100 year goal with smaller population sizes.

4. Reducing the projected 100 year time frame to 25 years which would allow maintaining a smaller population (80 to 100 animals depending upon founders and generation time). This would require focusing on joint management of the captive and wild populations with a goal of securing the status of the wild population within this time frame. If unsuccessful, the genetic status of the captive population could be restored with an infusion of genetic material from the wild. This would encourage captive and wild managers in range countries to collaborate in developing interactive management programs.

This last option could be illustrated by the status of the black-footed cat, currently a captive population of 41 animals of which 13 are effective founders. Using the Ballou CAPACITY Program 3.0 and a suggested generation time of 4.5 years for 100 years, it would be necessary to increase the effective founders in the population by five animals and increase the world carrying population to 517 animals (using an Ne/N of 0.29 and a lambda of 1.25). By reducing the time frame to 25 years, a more realistic carrying capacity of 103 animals is calculated. Further, when a 10 year time frame is used, only 34 animals would need to be managed in captivity to achieve program goals. Therefore, if it is impossible to implement Strategies 1-3, it is suggested that, in small cat populations with short generation times, captive management programs in the CAMP document be projected to a time frame of 25 years. This gives the captive and wildlife managers time to develop a proactive program for the long term management of small felids both *in situ* and *ex situ*.

The last step of the GCAR is for individual regions to begin to define specific interest in each recommended species/subspecies, information that later will drive regional responsibilities (i.e., the development of Regional Collection Plans) to preserve an overall viable world population. GCAR spreadsheets are constructed with columns for identification of regions currently holding the taxon and the number of specimens in captivity within that region (Table 7). Depending on the current captive population distribution and the global target recommendations for the taxon, regional populations targets can be set by each organized region of the zoo community. This, in fact, was done for the North American Region during the March 1994 workshop and this information comprises the specific Regional Collection Plan.

A review draft of the CAMP/GCAR report will be distributed by the CBSG to all participants and to TAG chairs and Species Conservation Coordinators for review and final comments before the document is finalized and distributed globally. The intent is to facilitate regional interaction to optimize the use of captive space and resources for international conservation. It should be re-emphasized that the GCAR document is a 'living' set of guidelines, meaning that it will be reassessed and revised continually based upon new information and shifting needs.

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SECTION 10

GLOBAL CAPTIVE ACTION RECOMMENDATIONS
SPREADSHEET CATEGORY DEFINITIONS AND SPREADSHEET

GLOBAL CAPTIVE ACTION RECOMMENDATIONS (GCAR) SPREADSHEET CATEGORIES

The Global Captive Action Recommendations (GCAR) spreadsheet is a working document that provides information to be used for assessing degree of threat and recommending conservation action. The first section of the spreadsheet summarizes information (usually gathered during the Conservation Assessment and Management Plan, CAMP, Workshop) on wild population status and level of captive program recommended for each taxon. This information can be used to identify priorities for captive management action.

TAXON

SCIENTIFIC NAME: Scientific names of extant taxa: genus, species, subspecies.

WILD POPULATION

EST #: Estimated numbers of individuals in the wild. If specific numbers are unavailable, general range of the population size is estimated.

M/L STS: Status according to Mace/Lande criteria (see explanation).

C = Critical
E = Endangered
V = Vulnerable
S = Secure
EXT = Extinct

CAPTIVE PROGRAM RECOMMENDATIONS

Recommendation: Level of Captive Program:

Level (1) A captive population is recommended as a component of a conservation program. This program has a tentative goal of developing and managing a population sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). The program is further defined with a species management plan encompassing the wild and captive populations and implemented immediately with available stock in captivity. If the current stock is insufficient to meet program goals, a species management plan should be developed to specify the need for additional founder stock. If no stock is present in captivity, then the program should be developed collaboratively with appropriate wildlife agencies, SSC Specialist Groups and cooperating institutions.

Level 2 (2) Similar to 'Level 1' except a species/subspecies management plan includes periodic reinforcement of the captive population with new genetic material from the wild. The levels and amount of genetic exchange needed should be defined in terms of the program goals, a population model and species management plan. It is anticipated that periodic supplementation with new genetic material will allow management of a smaller captive population. The time period for implementation of a Level 2 program will depend on recommendations made at the CAMP workshop.

Level (3) A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies, but is recommended for education, research or husbandry.

No (N) A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species or subspecies. Taxa already held in captivity may be included in this category. In this case, species/subspecies should be evaluated either for management toward a decrease in numbers or for complete limination from captive programs. This will assist in accommodating more species/subspecies of higher conservation priorty (as identified in the CAMP or in SSC Action Plans).

Pending (P) A decision on a captive program will depend upon further data either from a PHVA, a survey or existing identified sources to be queried.

WORLD

The information entered into this section of the GCAR spreadsheet defines the current global captive population and will be used to calculate target populations for each taxon recommended for captive management.

N: Size of the current captive population
Gen Lgth: Generation length
Ne: Effective population size
Lambda: Annual growth rate of the population
Trg Pop: Target population size computed using Ballou's CAPACITY program. This is the proposed number of individuals that must be maintained in captivity to achieve the level of captive program recommended for that taxon.

DISTRIBUTION OF CAPTIVE POPULATION

Loc: Location of a captive population of a particular taxon. This can be one of the organized regions of the zoo and aquarium world, a region not represented by formal zoo association or a specific country holding that taxon.

Pop: The number of individuals of a particular taxon currently maintained in the specified region.

Table 12. **GLOBAL CAPTIVE ACTION RECOMMENDATIONS FOR FELIDS**

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
1	Felis	aurata		V	N	11					N.America	0	0	ASMP			Eur	2	+	Africa	9	
2	Felis	aurata aurata (=cottoni)	100,000??	V	N	2					N.America	0	0	ASMP			Eur			Africa		
3	Felis	aurata celidogaster	50,000??	V	N	2					N.America	0	0	ASMP			Eur			Africa		
4	Felis	badia	<50??	C	P	0					N.America	0	0	ASMP			Eur			Africa		
5	Felis	bengalensis (No subsp.)	1,000,000	S	LEV 2	32	4	10	1.01	284	N.America	11	0	ASMP	1	0	Eur	89	↓	Africa		
6	Felis	bengalensis bengalensis	?	E	LEV 2	22	4	9	1.019	284	N.America	5	0	ASMP	1	0	Eur			Africa		
7	Felis	bengalensis borneoensis ls.	?	?	LEV 2	0					N.America		0	ASMP			Eur			Africa		
8	Felis	bengalensis chinensis	?	V	LEV 2	23					N.America		0	ASMP			Eur			Africa		
9	Felis	bengalensis euptilura	?	V	LEV 2	98					N.America	17	0	ASMP			Eur	81	↓	Africa		
10	Felis	bengalensis horsfieldi	?	V	LEV 2	?					N.America		0	ASMP			Eur			Africa		
11	Felis	bengalensis javanensis	?	V	LEV 2	0					N.America		0	ASMP			Eur			Africa		
12	Felis	bengalensis manchurica	?	V	LEV 2	0					N.America		0	ASMP			Eur			Africa		
13	Felis	bengalensis minutus		V	LEV 2	0					N.America		0	ASMP			Eur			Africa		
14	Felis	bengalensis sumatranus		V	LEV 2	0					N.America		0	ASMP			Eur			Africa		
15	Felis	bengalensis travellani	?	V	LEV 2	0					N.America		0	ASMP			Eur			Africa		
16	Felis	bieti	>10,000	E?	LEV 1	0	4	25	1.5	284	N.America	0	0	ASMP			Eur	0	0	Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
17	Felis	bieti bieti		?								0	0	ASMP			Eur			Africa		
18	Felis	bieti chutuchta	?	E?	N	?					N.America	0	0	ASMP			Eur			Africa		
19	Felis	bieti vellerosa	?	E?	N	?					N.America	0	0	ASMP			Eur			Africa		
20	Felis	chaus	>100,000	S	LEV 2	118	4	17	1.04	284	N.America	8	0	ASMP			Eur	110	↓	Africa		
21	Felis	chaus affinis		S	LEV 2						N.America		0	ASMP			Eur			Africa		
22	Felis	chaus chaus		S	LEV 2						N.America		0	ASMP			Eur			Africa		
23	Felis	chaus fulvidina		S	LEV 2						N.America		0	ASMP			Eur			Africa		
24	Felis	chaus furax		S	LEV 2						N.America		0	ASMP			Eur			Africa		
25	Felis	chaus kelaarti		S	LEV 2						N.America		0	ASMP			Eur			Africa		
26	Felis	chaus kutas		S	LEV 2						N.America		0	ASMP			Eur			Africa		
27	Felis	chaus nilotica		S	LEV 2						N.America		0	ASMP			Eur			Africa		
28	Felis	chaus prateri		S	LEV 2	5					N.America	5	0	ASMP			Eur			Africa		
29	Felis	colocolo (No subsp) Pampas Cat	>10,000	E?	LEV 2	30					N.America	0	0	ASMP			Eur	0	0	Africa		
30	Felis	colocolo braccata	500-1,000	E	LEV 2	2								ASMP			Eur			Africa		
31	Felis	colocolo budini		E	LEV 2	?					N.America	0	0	ASMP			Eur			Africa		
32	Felis	colocolo colocolo		E	LEV 2	?					N.America	0	0	ASMP			Eur			Africa		
33	Felis	colocolo crespoi		E	LEV 2	?					N.America	0	0	ASMP			Eur			Africa		
34	Felis	colocolo garleppi (Mtn Pop)	<2,000	E	LEV 1-2	<5	6	5	1.2	162	N.America	0	0	ASMP			Eur			Africa		
35	Felis	colocolo pajeros		E							N.America	0	0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
36	Felis	colocolo thomasi		E							N.America	0	0	ASMP			Eur			Africa		
37	Felis	concolor (no subsp)	?	?	N	234					N.America			ASMP	3	2	Eur	156	↓	Africa	17	
38	Felis	concolor acrodocia	?	V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
39	Felis	concolor anthonyi	?	V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
40	Felis	concolor aruacanus		V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
41	Felis	concolor azteca	>250	V	LEV 2	5					N.America	10		ASMP			Eur			Africa		
42	Felis	concolor bangsi	?	V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
43	Felis	concolor borbensis	?	V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
44	Felis	concolor browni	250	V	LEV 2	0					N.America			ASMP			Eur			Africa		
45	Felis	concolor cabrerae	?	V/S?	P	~30					N.America	0	0	ASMP			Eur			Africa		
46	Felis	concolor californica	5,000-10,000	V/S	LEV 2	0					N.America	12		ASMP			Eur			Africa		
47	Felis	concolor capricornensis	?	V/S?	P	~30					N.America	0	0	ASMP			Eur			Africa		
48	Felis	concolor concolor	?	V/S?	P	35					N.America	0	0	ASMP			Eur			Africa		
49	Felis	concolor coryi	30 - 50	C	LEV 1	11	7	7	1.2	90	N.America	14	+?	ASMP			Eur			Africa		
50	Felis	concolor costaricensis	500	V?/ E?	N	~30					N.America	12?	0	ASMP			Eur			Africa		
51	Felis	concolor cougar	?	V	LEV 2	0					N.America	0	0	ASMP			Eur			Africa		
52	Felis	concolor greeni	?	V/S?	P	~10					N.America	0	0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
53	Felis	concolor hippolestes	1,000 - 2,500?	V	LEV 2	14					N.America	10		ASMP			Eur			Africa		
54	Felis	concolor improcera	?	V	LEV 2	1					N.America	0	0	ASMP			Eur			Africa		
55	Felis	concolor incarum	?	V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
56	Felis	concolor kaibabensis	>5,000	V	LEV 2	3					N.America	1		ASMP			Eur			Africa		
57	Felis	concolor mayensis	1,000	V/E?	N	50					N.America	0	0	ASMP			Eur			Africa		
58	Felis	concolor missoulensis	>10,000	V/S	LEV 2	8					N.America	10		ASMP			Eur			Africa		
59	Felis	concolor oregonensis	>10,000	V/S	LEV 2	6					N.America	7		ASMP			Eur			Africa		
60	Felis	concolor osgoodi	?	V/S?	P	~5					N.America	0	0	ASMP			Eur			Africa		
61	Felis	concolor patagonica	?	V/S?	P	~3					N.America	0	0	ASMP			Eur			Africa		
62	Felis	concolor pearsoni	?	V/S?	P	~10					N.America	0	0	ASMP			Eur			Africa		
63	Felis	concolor puma	?	V/S?	P	~20					N.America	0	0	ASMP			Eur			Africa		
64	Felis	concolor schorgeri	0	EXT		0					N.America	0	0	ASMP			Eur			Africa		
65	Felis	concolor soderstromii	?	V/S?	P	~10					N.America	0	0	ASMP			Eur			Africa		
66	Felis	concolor stanleyana	300 - 500	V	LEV 2	11					N.America	11		ASMP			Eur			Africa		
67	Felis	concolor vancouverensis	<500	V	N	5					N.America	1		ASMP			Eur			Africa		
68	Felis	geoffroyi (No Subsp)	10,000	V	LEV 2	~70					N.America	14	0	ASMP			Eur	46	+80	Africa	4	

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
69	Felis	geoffroyi euxanthis		V										ASMP			Eur			Africa		
70	Felis	geoffroyi geoffroyi		V		2					N.America	0	0	ASMP			Eur			Africa		
71	Felis	geoffroyi paraguae		V		6					N.America	0	0	ASMP			Eur			Africa		
72	Felis	geoffroyi salinarum		V		9					N.America	0	0	ASMP			Eur			Africa		
73	Felis	guigna												ASMP			Eur			Africa		
74	Felis	guigna guigna (Kodkod)	3,000-5,000??	E?	P/LEV 2	0	6	6	1.2	162	N.America	0	0	ASMP			Eur	0	0	Africa		
75	Felis	guigna tigrillo	3,000-5,000?	E?	P/LEV 2	?					N.America	0	0	ASMP			Eur			Africa		
76	Felis	iriomotensis (leopard cat on 1 island)	100	C	LEV 1	?	4	13	1.5	394	N.America	0	0	ASMP			Eur	0	0	Africa		
77	Felis	jacobita Andean Mtn Cat	<1,000	C/E	P/LEV 1	0	6	0	1.2	162	N.America	0	0	ASMP			Eur	0	0	Africa		
78	Felis	manul (Pallas Cat)		V							N.America	0	50	ASMP			Eur	6	+50	Africa		
79	Felis	manul ferrugineus	>10,000	V	LEV 2	0	4	25	1.5	284	N.America	0	0	ASMP			Eur			Africa		
80	Felis	manul manul	>10,000	E/V	LEV 1	21	4	25	1.5	284	N.America	7	50	ASMP			Eur			Africa		
81	Felis	manul nigripectus	>10,000	V	LEV 2	2	4	25	1.5	284	N.America	2	0	ASMP			Eur			Africa		
82	Felis	margarita		E/V		22	4	7	1.5	284	N.America	0	?	ASMP			Eur	8	+50	Africa		
83	Felis	margarita harrisonii	<5,000	E/V?	LEV 2	<10	4.5	10	1.25	300	N.America	22	50	ASMP			Eur			Africa		

Felid CAMP & GCAR

CODE	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
84	Felis	margarita margarita	<5,000	E/V?	LEV 1	0	4.5	0	1.25	244	N.America	0	0	ASMP			Eur			Africa		
85	Felis	margarita scheffeli	EXT	EXT	N	<5					N.America	0	0	ASMP			Eur			Africa		
86	Felis	margarita thinobia	<1,000	E/V?	LEV 1	0	4.5	0	1.25	244	N.America	0	0	ASMP			Eur			Africa		
87	Felis	marmorata		E/V		3					N.America	0	0	ASMP			Eur			Africa		
88	Felis	marmorata charltoni	<5,000	E/V	LEV 1	4	4	25	1.5	284	N.America	0	0	ASMP			Eur			Africa		
89	Felis	marmorata marmorata	<5,000	E/V	LEV 1	2	4	25	1.5	284	N.America	0	0	ASMP			Eur	2		Africa		
90	Felis	nigripes		E	N	54					N.America	0	0	ASMP			Eur	36	50	Africa		
91	Felis	nigripes nigripes	?	E	LEV 1	27?	4.5	13	1.25	517	N.America	17	50	ASMP			Eur			Africa	10	
92	Felis	nigripes thomasi	?	E?	LEV 1	0					N.America	0	0	ASMP			Eur			Africa		
93	Felis	pardalis (No. Subsp) Ocelot	>10,000	V	LEV 2	400-500	6	175	1.2	152	N.America	68	0	ASMP	7	5	Eur	126	↓	Africa		
94	Felis	pardalis aequatorialis		V	LEV 2									ASMP			Eur			Africa		
95	Felis	pardalis albescens	<100	C	LEV 1	0	5	20	1.02	60	N.America	0	?	ASMP			Eur			Africa		
96	Felis	pardalis maripensis		V	LEV 2						N.America	0	0	ASMP			Eur			Africa		
97	Felis	pardalis mearnsi		V	LEV 2	1					N.America	0	0	ASMP			Eur			Africa		
98	Felis	pardalis mitis	2,500	E	LEV 2	30					N.America	0	50	ASMP			Eur			Africa		
99	Felis	pardalis nelsoni		V	LEV 2						N.America	0	0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
117	Felis	serval kempi		S		1					N.America			ASMP			Eur			Africa		
118	Felis	serval kivuensis (=liptosticta)		S							N.America			ASMP			Eur			Africa		
119	Felis	serval limpopooensis		S							N.America			ASMP			Eur			Africa		
120	Felis	serval lonnbergi (=serval)		S							N.America			ASMP			Eur			Africa		
121	Felis	serval phillipsi		S							N.America			ASMP			Eur			Africa		
122	Felis	serval togoensis		S							N.America			ASMP			Eur			Africa		
123	Felis	silvestris	>100,000	V?	N	6					N.America		0	ASMP			Eur	97	↓	Africa		
124	Felis	silvestris brockmani		V?							N.America		0	ASMP			Eur			Africa		
125	Felis	silvestris cafra		V?							N.America		0	ASMP			Eur			Africa		
126	Felis	silvestris caucasica		V?	LEV 2	1					N.America		0	ASMP			Eur	5	↓	Africa		
127	Felis	silvestris caudata		V?	LEV 2						N.America		0	ASMP			Eur			Africa		
128	Felis	silvestris chutuchta		V?	LEV 2						N.America		0	ASMP			Eur			Africa		
129	Felis	silvestris cretensis		V?	LEV 2						N.America		0	ASMP			Eur			Africa		
130	Felis	silvestris foxi		V?							N.America		0	ASMP			Eur			Africa		
131	Felis	silvestris grampi	<1,000	C/V ?	LEV 2	3	5	25	1.12	260	N.America	1	0	ASMP			Eur	24	?	Africa		
132	Felis	silvestris griselda		V							N.America		0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
133	Felis	silvestris haussa		V							N.America		0	ASMP			Eur			Africa		
134	Felis	silvestris iraki (incl. gordoni)	?	E/V?	LEV 1	?					N.America		0	ASMP			Eur	9	↓	Africa		
135	Felis	silvestris jordansi	?	E/V?	LEV 1	?					N.America		0	ASMP			Eur			Africa		
136	Felis	silvestris lybica	>500,000	S?	LEV 2	2					N.America		0	ASMP			Eur	46	?	Africa	10	
137	Felis	silvestris matschiei		V?	LEV 2						N.America		0	ASMP			Eur			Africa		
138	Felis	silvestris mellandi		V?							N.America		0	ASMP			Eur			Africa		
139	Felis	silvestris ocreata		V?							N.America		0	ASMP			Eur			Africa		
140	Felis	silvestris ornata	<500	E?	LEV 1	6	4	25	1.5	284	N.America		0	ASMP			Eur			Africa		
141	Felis	silvestris reyi		V?	LEV 2						N.America			ASMP			Eur			Africa		
142	Felis	silvestris rubida		V?							N.America		0	ASMP			Eur			Africa		
143	Felis	silvestris sarda		V?	LEV 2						N.America		0	ASMP			Eur			Africa		
144	Felis	silvestris silvestris	500,000	V?	LEV 2	33					N.America		0	ASMP			Eur	22	↓	Africa		
145	Felis	silvestris ugandae		V?		1					N.America		0	ASMP			Eur			Africa		
146	Felis	silvestris vellerosa		V?	LEV 2						N.America		0	ASMP			Eur			Africa		
147	Felis	temmincki Asian golden cat		?		23					N.America	0	0	ASMP	7	10	Eur	23	+50	Africa		
148	Felis	temmincki dominicanorum	<5,000	E	LEV 2	0	4	25	1.5	284	N.America	0	0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
149	Felis	temmincki temmincki	<10,000	V/E	LEV 1	3	4	5	1.01	284	N.America	3	0	ASMP			Eur			Africa		
150	Felis	temmincki tristis	<5,000	E	LEV 2	0	4	25	1.5	284	N.America	0	0	ASMP			Eur			Africa		
151	Felis	tigrina Tiger cat		E							N.America	5	0	ASMP			Eur	9	?	Africa		
152	Felis	tigrina guttula	>10,000	V	LEV 1	~75					N.America	1	50	ASMP			Eur			Africa		
153	Felis	tigrina oncilla	200-300?	C	LEV 1	0	5	1	1.2	258	N.America		0	ASMP			Eur			Africa		
154	Felis	tigrina pardinoides	2,500	E	LEV 1	50	5	25	1.2	234	N.America		0	ASMP			Eur			Africa		
155	Felis	tigrina tigrina	>10,000	V	LEV 1	~20					N.America		0	ASMP			Eur			Africa		
156	Felis	viverrinus Fishing cat		?	LEV 2	60	4	29	1.13	327	N.America	32	0	ASMP	3	12	Eur	39	↓	Africa		
157	Felis	viverrinus rizophoreus	<5,000	V	LEV 2	0	4	25	1.5	284	N.America	0	0	ASMP			Eur			Africa		
158	Felis	viverrinus viverrinus	<10,000	V	LEV 2	60	4	29	1.13	462	N.America	32?	50	ASMP			Eur			Africa		
159	Felis	wiedii (Margay)	>10,000	E	LEV 1	200-300	6	200	1.2	152	N.America	25	0	ASMP			Eur	20	50	Africa		
160	Felis	wiedii amazonica		E		2					N.America		0	ASMP			Eur			Africa		
161	Felis	wiedii boliviae		E		1					N.America		0	ASMP			Eur			Africa		
162	Felis	wiedii cooperi		E		0					N.America		0	ASMP			Eur			Africa		
163	Felis	wiedii glaucula		E		7					N.America	1	0	ASMP			Eur			Africa		
164	Felis	wiedii nicaraguae		E							N.America		0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
165	Felis	wiedii oaxacensis		E							N.America		0	ASMP			Eur			Africa		
166	Felis	wiedii pirrensis		E							N.America		0	ASMP			Eur			Africa		
167	Felis	wiedii salvinia		E							N.America		0	ASMP			Eur			Africa		
168	Felis	wiedii vigens	>5,000	V	LEV 3	1					N.America		0	ASMP			Eur			Africa		
169	Felis	wiedii wiedii	>2,000	E	LEV 1	8					N.America	7?	0	ASMP			Eur			Africa		
170	Felis	wiedii yucatanica		E							N.America		0	ASMP			Eur			Africa		
171	Felis	yagouaroundi	>10,000	V	LEV2						N.America	23	0	ASMP			Eur	16	↓	Africa		
172	Felis	yagouaroundi cacomitlli	1,000	E	LEV1	1	6	5	1.2	162	N.America		0	ASMP			Eur			Africa		
173	Felis	yagouaroundi ameghino	?	?	LEV 2						N.America		0	ASMP			Eur			Africa		
174	Felis	yagouaroundi eyra	10,000	V	LEV 2						N.America		0	ASMP			Eur			Africa		
175	Felis	yagouaroundi fossata	<1,000	E	LEV 2	7					N.America	1	0	ASMP			Eur			Africa		
176	Felis	yagouaroundi melantho	?	V	LEV 2						N.America		0	ASMP			Eur			Africa		
177	Felis	yagouaroundi panamensis	500-1,000	E	LEV 2	?					N.America		0	ASMP			Eur			Africa		
178	Felis	yagouaroundi tolteca	?	E	LEV 2	?					N.America		0	ASMP			Eur			Africa		
179	Felis	yagouaroundi yagouaroundi	>5,000	V	LEV 2	?					N.America		0	ASMP			Eur			Africa		
180	Lynx	canadensis	>100,000	S	N	73					N.America		30	ASMP			Eur	12	0	Africa		
181	Lynx	canadensis canadensis		S	N						N.America	63	0	ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
182	Lynx	canadensis subolanus		S	N	4					N.America	4	0	ASMP			Eur			Africa		
183	Lynx	caracal (no subsp)	<100,000	?	N	113					N.America	64	0	ASMP	4	0	Eur	93	↓	Africa	24	
184	Lynx	caracal algirus		S	LEV 2						N.America		0	ASMP			Eur			Africa		
185	Lynx	caracal caracal		S	LEV 2	9					N.America	2	0	ASMP			Eur			Africa		
186	Lynx	caracal damarensis		S	LEV 2	27					N.America	20	0	ASMP			Eur			Africa		
187	Lynx	caracal limpopoensis		S	LEV 2						N.America		0	ASMP			Eur			Africa		
188	Lynx	caracal lucani		S	LEV 2						N.America		0	ASMP			Eur			Africa		
189	Lynx	caracal michaelis	<500	C	N	10					N.America	2	50	ASMP			Eur			Africa		
190	Lynx	caracal nubicus		S	LEV 2						N.America		0	ASMP			Eur			Africa		
191	Lynx	caracal poecilotis		S	LEV 2	4					N.America		0	ASMP			Eur			Africa		
192	Lynx	caracal schmitzi	<500?	C	N	3					N.America		0	ASMP	3	6	Eur			Africa		
193	Lynx	lynx (no subsp)	>10,000?	?	N	44					N.America	3	30	ASMP	1	0	Eur	104	↓	Africa		
194	Lynx	lynx dinniki	?	S	N						N.America		0	ASMP			Eur			Africa		
195	Lynx	lynx isabellina	>10,000	S	N						N.America		0	ASMP			Eur			Africa		
196	Lynx	lynx kozlovi	>10,000	S	N						N.America		0	ASMP			Eur	9	?	Africa		
197	Lynx	lynx lynx	?	S	N	34					N.America	3	0	ASMP			Eur	180	↓	Africa		
198	Lynx	lynx sardiniae	?	S	N						N.America		0	ASMP			Eur			Africa		
199	Lynx	lynx stroganovi	?	S	N						N.America		0	ASMP			Eur			Africa		
200	Lynx	lynx wrangeli	?	S	N	47					N.America	17	0	ASMP			Eur	76	↓	Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
201	Lynx	pardinus (Spanish lynx)	<1,000	C	LEV 1	3	5	25	1.15	240	N.America	0	0	ASMP			Eur	3	100	Africa		
202	Lynx	rufus (no subsp)		S	N						N.America	121	30	ASMP	6	3	Eur	51	↓	Africa	1	
203	Lynx	rufus bailey		S	N	136					N.America	2	0	ASMP			Eur			Africa		
204	Lynx	rufus californicus		S	N	2					N.America	4	0	ASMP			Eur			Africa		
205	Lynx	rufus escuinapae	?	V	N	7					N.America	1	0	ASMP			Eur			Africa		
206	Lynx	rufus fasciatus	>100	S	N	2					N.America	1	0	ASMP			Eur			Africa		
207	Lynx	rufus floridanus	10,000-100,000	S	N	11					N.America	12	0	ASMP			Eur			Africa		
208	Lynx	rufus gigas	>100	S	N	1					N.America	1	0	ASMP			Eur			Africa		
209	Lynx	rufus oaxacensis	>100	S	N	0					N.America		0	ASMP			Eur			Africa		
210	Lynx	rufus pallescens	>1,000-10,000	S	N	11					N.America	9	0	ASMP			Eur			Africa		
211	Lynx	rufus peninsularis	>100	S	N	0					N.America		0	ASMP			Eur			Africa		
212	Lynx	rufus rufus	>1,000	S	N	20					N.America		0	ASMP			Eur			Africa		
213	Lynx	rufus superiorensis	>1,000	S	N	4					N.America	4	0	ASMP			Eur			Africa		
214	Lynx	rufus texensis	>10,000	S	N	6					N.America	9	0	ASMP			Eur			Africa		
215	Neofelis	nebulosa	<10,000	C/E	LEV1	140	7	38	1.03	285	N.America	97	+	ASMP	2	10	Eur	48	75	Africa		
216	Neofelis	nebulosa brachyurus		C							N.America	0	0	ASMP			Eur			Africa		
217	Neofelis	nebulosa diardi		C		1	7	25	1.03	354	N.America			ASMP			Eur			Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
218	Neofelis	nebulosa macrosceloides		E							N.America			ASMP			Eur			Africa		
219	Neofelis	nebulosa nebulosa		E		11					N.America	8		ASMP			Eur			Africa		
220	Acinonyx	jubatus	10,000-15,000	E	LEV 1	1,000	5.5	210	1.010	410	N.America	301	300	ASMP	20	47	Eur	364	400	Africa	226	
221	Acinonyx	jubatus hecki	<500	E	N						N.America	0	0	ASMP			Eur			Africa		
222	Acinonyx	jubatus jubatus	10,000	V	N	315					N.America	143	143	ASMP			Eur			Africa		
223	Acinonyx	jubatus raineyi	<1,000	E	N	0					N.America	0	0	ASMP			Eur			Africa		
224	Acinonyx	jubatus sommeringii	<2,000	E	N	0					N.America	0	0	ASMP			Eur			Africa		
225	Acinonyx	jubatus venaticus	<100	C	N	0					N.America	0	0	ASMP			Eur			Africa		
226	Panthera	leo (African Lion)		?							N.America	153 ?	?	ASMP	28	34	Eur	560	↓	Africa	59	
227	Panthera	leo azandica	?	V	N	0					N.America	0	0	ASMP			Eur			Africa		
228	Panthera	leo bleyenberghi	<1,000	V	N	0					N.America	0	0	ASMP			Eur			Africa		
229	Panthera	leo krugeri	<10,000	V	LEV 1	24	9	24	1.25	80	N.America	23	80	ASMP			Eur			Africa		
230	Panthera	leo leo	EXT	EXT		52 (generic)					N.America	0	0	ASMP			Eur			Africa		
231	Panthera	leo melanchaita	EXT	EXT							N.America	0	0	ASMP			Eur			Africa		
232	Panthera	leo nubica	10,000	V	LEV 2	8	9	4	1.25	94	N.America	6	80	ASMP			Eur			Africa		
233	Panthera	leo persica	<300	C	LEV 1	65?	7	25	1.01	286	N.America	15?	+	ASMP	0	26	Eur	22	100	Africa		
234	Panthera	leo senegalensis	<1,000?	E	LEV 2	0	9	0	1.25	94	N.America	0	80	ASMP			Eur			Africa		
235	Panthera	onca (No subsp)	>10,000	E	LEV 1	3,000					N.America	88	50	ASMP	6	4	Eur	166	↓	Africa	26	

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
236	Panthera	onca arizonensis	<500	C	LEV 1	<10	7	5	1.5	162	N.America	4?	0	ASMP			Eur			Africa		
237	Panthera	onca centralis	1,000	E	LEV 1	100	7	50	1.5	136	N.America		0	ASMP			Eur			Africa		
238	Panthera	onca goldmani	1,000	E	LEV 1	20	7	10	1.5	162	N.America		0	ASMP			Eur			Africa		
239	Panthera	onca hernandesii	<500	C	LEV 1	40	7	5	1.5	162	N.America		0	ASMP			Eur			Africa		
240	Panthera	onca onca	10,000	E	LEV 1	~200					N.America	3	0	ASMP			Eur			Africa		
241	Panthera	onca palustris	5,000	E	LEV 1	50	7	25	1.5	162	N.America	2	50	ASMP			Eur			Africa		
242	Panthera	onca peruvianus	<500	C	LEV 1	<10	7	5	1.5	162	N.America		0	ASMP			Eur			Africa		
243	Panthera	onca veraecruscis	<500	C	LEV 1	<10	7	5	1.5	162	N.America		0	ASMP			Eur			Africa		
244	Panthera	pardus (no subsp)		?	N	184					N.America	82	0	ASMP	2	2	Eur	201	↓	Africa	24	
245	Panthera	pardus adersi	<50	C	N	0					N.America	0	0	ASMP			Eur			Africa		
246	Panthera	pardus adusta	5,000	S	N	0					N.America	0	0	ASMP			Eur			Africa		
247	Panthera	pardus chui	5,000	S	N	0					N.America	0	0	ASMP			Eur			Africa		
248	Panthera	pardus ciscaucasia	<25	C	N	0					N.America	0	0	ASMP			Eur			Africa		
249	Panthera	pardus dathei	<500	C	N	0					N.America	0	0	ASMP			Eur			Africa		
250	Panthera	pardus delacouri	<5,000	V	N	15					N.America	7	0	ASMP			Eur	8	?	Africa		
251	Panthera	pardus fusca	10,000	V	N	3					N.America	3	0	ASMP			Eur			Africa		
252	Panthera	pardus ituriensis	>100,000	S	N	0					N.America	0	0	ASMP			Eur			Africa		
253	Panthera	pardus kotiya	<250	C	LEV 1	40	7	13	1.01	276	N.America	0	0	ASMP			Eur	31	+	Africa		
254	Panthera	pardus japonensis	<5,000	E	LEV 2	100	7	39	1.01	197	N.America	27	0	ASMP			Eur	43	+	Africa		

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
255	Panthera	pardus jarvesi	EXT	EXT	N	0					N.America	0	0	ASMP			Eur			Africa		
256	Panthera	pardus leopardus	<10,000	V	N	1					N.America	0	0	ASMP			Eur			Africa		
257	Panthera	pardus melanotica	<500	S	N	8					N.America	0	0	ASMP			Eur			Africa		
258	Panthera	pardus melas	<500	E	N	8					N.America	0	0	ASMP	0	4	Eur			Africa		
259	Panthera	pardus millardi	<2,000	V	N	0					N.America	0	0	ASMP			Eur			Africa		
260	Panthera	pardus nannopardus	<100	C	N	0					N.America	0	0	ASMP			Eur			Africa		
261	Panthera	pardus nimr	<100	C	N	6					N.America	0	0	ASMP			Eur			Africa		
262	Panthera	pardus orientalis	<100	C	LEV 1	136	7	48	1.13	177	N.America	39		ASMP			Eur	83	+	Africa		
263	Panthera	pardus panthera	<20	C	N	0					N.America	0	0	ASMP			Eur			Africa		
264	Panthera	pardus pardus	<1,000	E	N	0					N.America	0	0	ASMP			Eur			Africa		
265	Panthera	pardus pernigra	<2,000	V	N	1					N.America	0	0	ASMP			Eur			Africa		
266	Panthera	pardus reichenowi	<5,000	V	N	0					N.America	0	0	ASMP			Eur			Africa		
267	Panthera	pardus saxicolor	<500	E	LEV 1 (EEP)	129	7	45	1.01	268	N.America	14		ASMP	10	6	Eur	76	+	Africa		
268	Panthera	pardus shortridgei	<100,000	V	N	SOME					N.America	0	0	ASMP			Eur			Africa		
269	Panthera	pardus sindica	<500	E	N	1					N.America	1	0	ASMP			Eur			Africa		
270	Panthera	pardus suahelica	50,000	S	N	0					N.America	0	0	ASMP			Eur			Africa		
271	Panthera	pardus tulliana	<25	C	N	0					N.America	0	0	ASMP			Eur			Africa		
272	Panthera	tigris (no subsp)									N.America	58	0	ASMP	5	2	Eur	200 +	↓	Africa	11	

	TAXON		CAMP DATA			WORLD					DISTRIBUTION OF CAPTIVE POPULATION											
CODE	SCIENTIFIC NAME		WILD EST#	M/L	REC	N	Gen Lgth	Ne	Lambda	Trg Pop	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg	Loc	Pop	Trg
273	Panthera	tigris altaica	<250	C	LEV 1	711	7				N.America	104		ASMP	1	0	Eur	228	228	Africa	1	
274	Panthera	tigris amoyensis	40	C	LEV 1	52	8	10	1.1	580	N.America	0	0	ASMP			Eur	0		Africa		
275	Panthera	tigris balica	EXT	EXT							N.America	0		ASMP			Eur	0		Africa		
276	Panthera	tigris corbetti	<2,000	E	LEV 1	14	7	2	1.01	267	N.America	10		ASMP			Eur	0		Africa		
277	Panthera	tigris sondaica	EXT	EXT							N.America	0	0	ASMP			Eur			Africa		
278	Panthera	tigris sumatrae	400-500	C	LEV 1	235	7	46	1.04	149	N.America	56		ASMP	8	20	Eur	150	150	Africa	1	
279	Panthera	tigris tigris	<3,500	E	LEV 1	145	7	84	1.01	279	N.America	2	0	ASMP			Eur	0	+	Africa		
280	Panthera	tigris virgata	EXT	EX							N.America	0	0	ASMP			Eur			Africa		
281	Panthera	uncia	5,000-7,000	E/V	LEV 1	450	7	153	1.1	209	N.America	256		ASMP	6	9	Eur	193	200	Africa		

Europe: ↓ = Taxa whose populations are planned to be reduced in size but are unlikely to be eliminated from European Zoos by the turn of the century.

↑ = Taxa whose populations are planned to be expanded.

FELID
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
AND
GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

SECTION 11

WORKSHOP PARTICIPANTS

Essay

Assessing Extinction Threats: Toward a Reevaluation of IUCN Threatened Species Categories

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Abstract: *IUCN categories of threat (Endangered, Vulnerable, Rare, Indeterminate, and others) are widely used in 'Red lists' of endangered species and have become an important tool in conservation action at international, national, regional, and thematic levels. The existing definitions are largely subjective, and as a result, categorizations made by different authorities differ and may not accurately reflect actual extinction risks. We present proposals to redefine categories in terms of the probability of extinction within a specific time period, based on the theory of extinction times for single populations and on meaningful time scales for conservation action. Three categories are proposed (CRITICAL, ENDANGERED, VULNERABLE) with decreasing levels of threat over increasing time scales for species estimated to have at least a 10% probability of extinction within 100 years. The process of assigning species to categories may need to vary among different taxonomic groups, but we present some simple qualitative criteria based on population biology theory, which we suggest are appropriate at least for most large vertebrates. The process of assessing threat is clearly distinguished from that of setting priorities for conservation action, and only the former is discussed here.*

Resumen: *La categorización de la Unión Internacional para la Conservación de la Naturaleza (UICN) de las especies amenazadas (en peligro, vulnerables, raras, indeterminadas y otras) son ampliamente utilizadas en las Listas Rojas de especies en peligro y se han convertido en una herramienta importante para las acciones de conservación al nivel internacional, nacional, regional y temático. Las definiciones de las categorías existentes son muy subjetivas y, como resultado, las categorizaciones hechas por diferentes autores difieren y quizás no reflejen con certeza el riesgo real de extinción. Presentamos propuestas para re-definir las categorías en términos de la probabilidad de extinción dentro de un período de tiempo específico. Las propuestas están basadas en la teoría del tiempo de extinción para poblaciones individuales y en escalas de tiempo que tengan significado para las acciones de conservación. Se proponen tres categorías (CRITICA, EN PELIGRO, VULNERABLE) con niveles decrecientes de amenaza sobre escalas de tiempo en aumento para especies que se estima tengan cuando ménos un 10% de probabilidad de extinción en 100 años. El proceso de asignar especies a categorías puede que necesite variar dentro de los diferentes grupos taxonómicos pero nosotros presentamos algunos criterios cualitativos simples basados en la teoría de la biología de las poblaciones, las cuales sugerimos son apropiadas para cuando ménos la mayoría de los grandes vertebrados. El proceso de evaluar la amenaza se distingue claramente del de definir las prioridades para las acciones de conservación, sólamente el primero se discute aquí.*

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Introduction

Background

The Steering Committee of the Species Survival Commission (SSC) of the IUCN has initiated a review of the overall functioning of the Red Data Books. The review will cover three elements: (1) the form, format, content, and publication of Red Data Books; (2) the categories of threat used in Red Data Books and the IUCN Red List (Extinct, Endangered, Vulnerable, Rare, and Indeterminate); and (3) the system for assigning species to categories. This paper is concerned with the second element and includes proposals to improve the objectivity and scientific basis for the threatened species categories currently used in Red Data Books (see IUCN 1988 for current definitions).

There are at least three reasons why a review of the categorization system is now appropriate: (1) the existing system is somewhat circular in nature and excessively subjective. When practiced by a few people who are experienced with its use in a variety of contexts it can be a robust and workable system, but increasingly, different groups with particular regional or taxonomic interests are using the Red Data Book format to develop local or specific publications. Although this is generally of great benefit, the interpretation and use of the present threatened species categories are now diverging widely. This leads to disputes and uncertainties over particular species that are not easily resolved and that ultimately may negatively affect species conservation. (2) Increasingly, the categories of threat are being used in setting priorities for action, for example, through specialist group action plans (e.g., Oates 1986; Eudey 1988; East 1988, 1989; Schreiber et al. 1989). If the categories are to be used for planning then it is essential that the system used to establish the level of threat be consistent and clearly understood, which at present it does not seem to be. (3) A variety of recent developments in the study of population viability have resulted in techniques that can be helpful in assessing extinction risks.

Assessing Threats Versus Setting Priorities

In the first place it is important to distinguish systems for assessing threats of extinction from systems designed to help set priorities for action. The categories of threat should simply provide an assessment of the likelihood that if current circumstances prevail the species will go extinct within a given period of time. This should be a scientific assessment, which ideally should be completely objective. In contrast, a system for setting priorities for action will include the likelihood of extinction, but will also embrace numerous other factors, such as the likelihood that restorative action will be successful; economic, political, and logistical considerations; and perhaps the taxonomic distinctiveness of the species under review. Various categorization systems used in the past, and proposed more recently, have confounded these two processes (see Fitter & Fitter 1987; Munton 1987). To devise a general system for setting priorities is not useful because different concerns predominate within different taxonomic, ecological, geographical, and political units. The process of setting priorities is therefore best left to specific plans developed by specialist bodies such as the national and international agencies, the specialist groups, and other regional bodies that can devise priority assessments in the appropriate regional or taxonomic context. An objective assessment of extinction risk may also then contribute to the decisions taken by governments on which among a variety of recommendations to implement. The present paper is therefore confined to a discussion of assessing threats.

Aims of the System of Categorization

For Whom?

Holt (1987) identifies three different groups whose needs from Red Data Books (and therefore categories of threat) may not be mutually compatible: the lay public, national and international legislators, and conservation professionals. In each case the purpose is to highlight taxa with a high extinction risk, but there are differences in the quality and quantity of information needed to support the assessment. Scott et al. (1987) make the point that in many cases simple inclusion in a Red Data Book has had as much effect on raising awareness as any of the supporting data (see also Fitter 1974). Legislators need a simple, but objective and soundly based system because this is most easily incorporated into legislation (Bean 1987). Legislators frequently require some statement about status for every case they consider, however weak the available information might be. Inevitably, therefore, there is a conflict between expediency and the desire for scientific credibility and objectivity. Conservationists generally require more precision, particularly if they are involved in planning conservation programs that aim to make maximal use of limited resources.

Characteristics of an Ideal System

With this multiplicity of purposes in mind it is appropriate to consider various characteristics of an ideal system:

(1) The system should be essentially simple, providing easily assimilated data on the risk of extinction. In terms of assessing risk, there seems to be little virtue in developing numerous categories, or in categorizing risk on the basis of a range of different parameters (e.g., abundance, nature of threat, likelihood of persistence of threat, etc.). The categories should be few in number,

should have a clear relationship to one another (Holt 1987; Munton 1987), and should be based around a probabilistic assessment of extinction risk.

(2) The system for categorization has to be flexible in terms of data required. The nature and amount of data available to assess extinction risks varies widely from almost none (in the vast majority of species) to highly detailed population data (in a very few cases). The categorization system should make maximum use of whatever data are available. One beneficial consequence of this process would be to identify key population data for field workers to collect that would be useful in assessing extinction risk.

(3) The categorization system also needs to be flexible in terms of the population unit to which it applies. Throughout this discussion, it is assumed that the system being developed will apply to any species, subspecies, or geographically separate population. The categorization system therefore needs to be equally applicable to limited lower taxonomic levels and to more limited geographical scope. Action planning will need to be focused on particular taxonomic groups or geographical areas, and can then incorporate an additional system for setting priorities that reflect taxonomic distinctiveness and extinction risks outside the local area (e.g., see East 1988, 1989; Schreiber et al. 1989).

(4) The terminology used in categorization should be appropriate, and the various terms used should have a clear relationship to each other. For example, among the current terms both 'endangered' and 'vulnerable' are readily comprehended, but 'rare' is confusing. It can be interpreted as a statement about distribution status, level of threat, or local population size, and the relationships between these factors are complex (Rabinowitz et al. 1986). Rare (i.e., low-density) species are not always at risk and many species at risk are not numerically rare (King 1987; Munton 1987; Heywood 1988). The relationship of 'rare' to 'endangered' and 'vulnerable' is also unclear.

(5) If the system is to be objectively based upon sound scientific principles, it should include some assessment of uncertainty. This might be in terms of confidence levels, sensitivity analyses, or, most simply, on an ordinal scale reflecting the adequacy of the data and models in any particular case.

(6) The categories should incorporate a time scale. On a geological time scale all species are doomed to extinction, so terms such as "in danger of extinction" are rather meaningless. The concern we are addressing here is the high background level of the current rates of extinction, and one aim is therefore preservation over the upcoming centuries (Soulé & Simberloff 1986). Therefore, the probability of extinction should be expressed in terms of a finite time scale, for example, 100 years. Munton (1987) suggests using a measure of number of years until extinction. However, since most models of population extinction times result in approximately exponential distributions, as in Goodman's (1987) model of density-dependent population growth in a fluctuating environment, mean extinction time may not accurately reflect the high probability that the species will go extinct within a time period considerably shorter than the mean (see Fig. 1). More useful are measures such as "95% likelihood of persistence for 100 years."

Population Viability Analysis and Extinction Factors

Various approaches to defining viable populations have been taken recently (Shaffer 1981, 1990; Gilpin & Soulé, 1986; Soulé 1987). These have emphasized that there is no simple solution to the question of what constitutes a viable population. Rather, through an analysis of extinction factors and their interactions it is possible to assess probabilities and time scales for population persistence for a particular taxon at a particular time and place. The development of population viability analyses has led to the definition of intrinsic and extrinsic factors that determine extinction risks (see Soulé 1983; Soulé 1987; Gilpin & Soulé 1986; see also King 1987). Briefly these can be summarized as population dynamics (number of individuals, life history and age or stage distribution, geographic structure, growth rate, variation in demographic parameters), population characteristics (morphology, physiology, genetic variation, behavior and dispersal patterns), and environmental effects (habitat quality and quantity, patterns and rates of environmental disturbance and change, interactions with other species including man).

Preliminary models are available to assess a population's expected persistence under various extinction pressures, for example, demographic variation (Goodman 1987*a*, *b*; Belovsky 1987; CBSG 1989), catastrophes (Shaffer 1987), inbreeding and loss of genetic diversity (Lande & Barrowclough 1987; Lacy 1987), metapopulation structure (Gilpin 1987; Quinn & Hastings 1987; Murphy et al. 1990). In addition, various approaches have been made to modeling extinction in populations threatened by habitat loss (e.g., Gutiérrez & Carey 1985; Maguire et al. 1987; Lande 1988), disease (e.g., Anderson & May 1979; Dobson & May 1986; Seal et al. 1989), parasites (e.g., May & Anderson 1979; May & Robinson 1985; Dobson & May 1986), competitors, poaching (e.g., Caughley 1988), and harvesting or hunting (e.g., Holt 1987).

So far, the development of these models has been rather limited, and in particular they often fail to successfully incorporate several different extinction factors and their interactions (Lande 1988). Nevertheless the approach has been applied in particular cases even with

existing models (e.g., grizzly bear: Shaffer 1983; spotted owl: Gutiérrez & Carey 1985; Florida panther: CBSG 1989), and there is much potential for further development.

Although different extinction factors may be critical for different species, other, noncritical factors cannot be ignored. For example, it seems likely that for many species, habitat loss constitutes the most immediate threat. However, simply preserving habitats may not be sufficient to permit long term persistence if surviving populations are small and subdivided and therefore have a high probability of extinction from demographic or genetic causes. Extinction factors may also have cumulative or synergistic effects; for example, the hunting of a species may not have been a problem before the population was fragmented by habitat loss. In every case, therefore, all the various extinction factors and their interactions need to be considered. To this end more attention needs to be directed toward development of models that reflect the random influences that are significant to most populations, that incorporate the effects of many different factors, and that relate to the many plant, invertebrate, and lower vertebrate species whose population biology has only rarely been considered so far by these methods.

Viability analysis should suggest the appropriate kind of data for assigning extinction risks to species, though much additional effort will be needed to develop appropriate models and collect appropriate field data.

Proposal

Three Categories and Their Justification

We propose the recognition of three categories of threat (plus EXTINCT), defined as follows:

CRITICAL:	50% probability of extinction within 5 years or 2 generations, whichever is longer.
ENDANGERED:	20% probability of extinction within 20 years or 10 generations, whichever is longer.
VULNERABLE:	10% probability of extinction within 100 years.

These definitions are based on a consideration of the theory of extinction times for single populations as well as on meaningful time scales for conservation action. If biological diversity is to be maintained for the foreseeable future at anywhere near recent levels occurring in natural ecosystems, fairly stringent criteria must be adopted for the lowest level of extinction risk, which we call VULNERABLE. A 10% probability of extinction within 100 years has been suggested as the highest level of risk that is biologically acceptable (Shaffer 1981) and seems appropriate for this category. Furthermore, events more than about 100 years in the future are hard to foresee, and this may be the longest duration that legislative systems are capable of dealing with effectively.

It seems desirable to establish a CRITICAL category to emphasize that some species or populations have a very high risk of extinction in the immediate future. We propose that this category include species or populations with a 50% chance of extinction within 5 years or two generations, and which are clearly at very high risk.

An intermediate category, ENDANGERED, seems desirable to focus attention on species or populations that are in substantial danger of extinction within our lifetimes. A 20% chance of extinction within 20 years or 10 generations seems to be appropriate in this context.

For increasing levels of risk represented by the categories VULNERABLE, ENDANGERED, and CRITICAL, it is necessary to increase the probability of extinction or to decrease the time scale, or both. We have chosen to do both for the following reasons. First, as already mentioned, decreasing the time scale emphasizes the immediacy of the situation. Ideally, the time scale should be expressed in natural biological units of generation time of the species or population (Leslie 1966), but there is also a natural time scale for human activities such as conservation efforts, so we have given time scales in years and in generations for the CRITICAL and ENDANGERED categories.

Second, the uncertainty of estimates of extinction probabilities decreases with increasing risk levels. In population models incorporating fluctuating environments and catastrophes, the probability distribution of extinction times is approximately exponential (Nobile et al. 1985; Goodman 1987). In a fluctuating environment where a population can become extinct only through a series of unfavorable events, there is an initial, relatively brief period in which the chance of extinction is near zero, as in the inverse Gaussian distribution of extinction times for density-independent fluctuations (Ginzburg et al. 1982; Lande & Orzack 1988). If catastrophes that can extinguish the population occur with probability p per unit time, and are much more important than normal environmental fluctuations, the probability distribution of extinction times is approximately exponential, pe^{-pt}, and the cumulative probability of extinction up to time t is approximately $1 - e^{-pt}$. Thus, typical probability distributions of extinction times look like the curves in Figures 1A and 1B, and the cumulative probabilities of extinction up to any given time look like the curves in Figures 1C and 1D. Dashed curves represent different distributions of extinction times and cumulative extinction probabilities obtained by changing the model parameters in a formal population viability analysis (e.g., different amounts of environmental variation in demographic parameters). The uncertainty in an

estimate of cumulative extinction probability up to a certain time can be measured by its coefficient of variation, that is, the standard deviation among different estimates of the cumulative extinction probability with respect to reasonable variation in model parameters, divided by the best estimate. It is apparent from Figures 1C and 1D that at least for small variations in the parameters (if the parameters are reasonably well known), the uncertainty of estimates of cumulative extinction probability at particular times decreases as the level of risk increases. Thus at times, t_1, t_2, and t_3 when the best estimates of the cumulative extinction probabilities are 10%, 20%, and 50% respectively, the corresponding ranges of extinction probabilities in Figure 1C are 6.5%–14.8%, 13.2%–28.6%, and 35.1%–65.0%, and in Figure 1D are 6.8%–13.1%, 13.9%–25.7%, and 37.2%–60.2%. Taking half the range as a rough approximation of the standard deviation in this simple illustration gives uncertainty measures of 0.41, 0.38, and 0.30 in Figure 1C, and 0.31, 0.29, and 0.23 in Figure 1D, corresponding to the three levels of risk. Given that for practical reasons we have chosen to shorten the time scales for the more threatened categories, these results suggest that to maintain low levels of uncertainty, we should also increase the probabilities of extinction in the definition of the ENDANGERED and CRITICAL categories.

These definitions are based on general principles of population biology with broad applicability, and we believe them to be appropriate across a wide range of life forms. Although we expect the process of assigning species to categories (see below) to be an evolving (though closely controlled and monitored) process, and one that might vary across broad taxonomic groups, we recommend that the definitions be constant both across taxonomic groups and over time.

Assigning Species or Populations to Categories

We recognize that in most cases, there are insufficient data and imperfect models on which to base a formal probabilistic analysis. Even when considerable information does exist there may be substantial uncertainties in the extinction risks obtained from population models containing many parameters that are difficult to estimate accurately. Parameters such as environmental stochasticity (temporal fluctuations in demographic parameters such as age- or developmental stage–specific mortality and fertility rates), rare catastrophic events, as well as inbreeding depression and genetic variability in particular characters required for adaptation are all difficult to estimate accurately. Therefore it may not be possible to do an accurate probabilistic viability analysis even for some very well studied species. We suggest that the categorization of many species should be based on more qualitative criteria derived from the same body of theory as the definitions above, which will broaden the scope and applicability of the categorization system. In these more qualitative criteria we use measures of effective population size (N_e) and give approximate equivalents in actual population size (N). It is important to recognize that the relationship between N_e and N depends upon a variety of interacting factors. Estimating N_e for a particular population will require quite extensive information on breeding structure and life history characteristics of the population and may then produce only an approximate figure (Lande & Barrowclough 1987). In addition, different methods of estimating N_e will give variable results (Harris & Allendorf 1989). N_e/N ratios vary widely across species, but are typically in the range 0.2 to 0.5. In the criteria below we give a value for N_e as well as an approximate value of N assuming that the N_e/N ratio is 0.2.

We suggest the following criteria for the three categories:

CRITICAL: 50% probability of extinction within 5 years or 2 generations, whichever is longer, or

(1) Any **two** of the following criteria:
- (a) Total population $N_e < 50$ (corresponding to actual $N < 250$).
- (b) Population fragmented: ≤2 subpopulations with $N_e > 25$ ($N > 125$) with immigration rates <1 per generation.
- (c) Census data of >20% annual decline in numbers over the past 2 years, or >50% decline in the last generation, or equivalent projected declines based on demographic projections after allowing for known cycles.
- (d) Population subject to catastrophic crashes (>50% reduction) per 5 to 10 years, or 2 to 4 generations, with subpopulations highly correlated in their fluctuations.

or (2) Observed, inferred, or projected habitat alteration (i.e., degradation, loss, or fragmentation) resulting in characteristics of (1).

or (3) Observed, inferred, or projected commercial exploitation or ecological interactions with introduced species (predators, competitors, pathogens, or parasites) resulting in characteristics of (1).

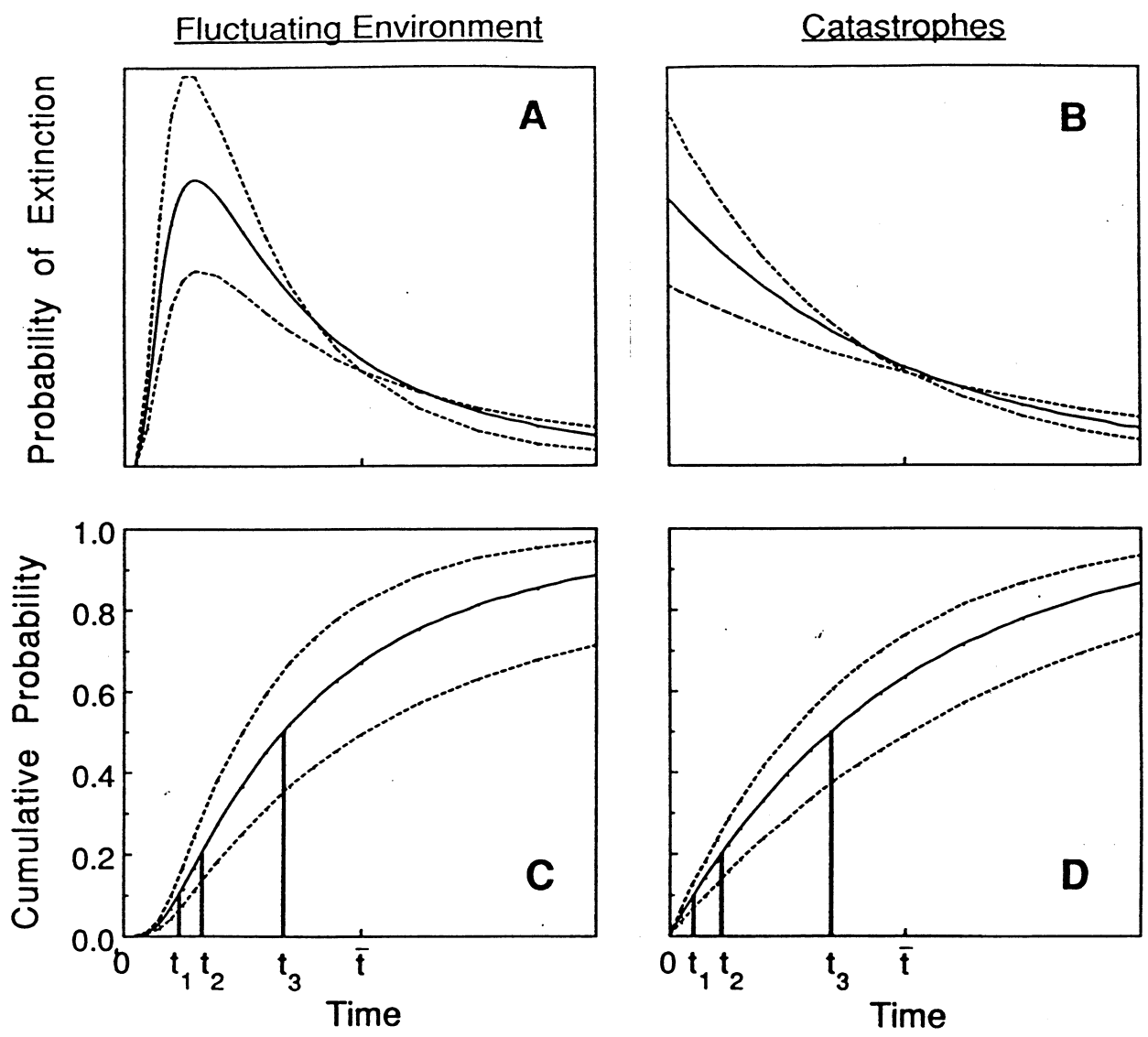

Figure 1. Probability distributions of time to extinction in a fluctuating environment, inverse Gaussian distributions (A), or with catastrophes, exponential distributions (B). Corresponding cumulative extinction probabilities of extinction up to any given time are shown below (C and D). Solid curves represent the best estimates from available data and dashed curves represent different estimates based upon the likely range of variation in the parameters. t_1, t_2, and t_3 are times at which the best estimates of cumulative extinction probabilities are 10%, 20%, and 50%. $\bar{t}$ is the expected time to extinction in the solid curves.

ENDANGERED:

20% probability of extinction within 20 years or 10 generations, whichever is longer, or

(1) Any **two** of the following or any **one** criterion under CRITICAL

(a) Total population $N_e < 500$ (corresponding to actual $N < 2,500$).

(b) Population fragmented:

(i) ≤5 subpopulations with $N_e > 100$ ($N > 500$) with immigration rates <1 per generation, or

(ii) ≤2 subpopulations with $N_e > 250$ ($N > 1,250$) with immigration rates <1 per generation.

(c) Census data of >5% annual decline in numbers over past 5 years, or >10% decline per generation over past 2 generations, or equivalent projected declines based on demographic data after

allowing for known cycles.

(d) Population subject to catastrophic crashes: an average of >20% reduction per 5 to 10 years or 2 to 4 generations, or >50% reduction per 10 to 20 years or 5 to 10 generations, with subpopulations strongly correlated in their fluctuations.

or (2) Observed, inferred, or projected habitat alteration (i.e., degradation, loss, or fragmentation) resulting in characteristics of (1).

or (3) Observed, inferred, or projected commercial exploitation or ecological interactions with introduced species (predators, competitors, pathogens, or parasites) resulting in characteristics of (1).

VULNERABLE:

10% probability of extinction within 100 years, or

(1) Any **two** of the following criteria or any **one** criterion under ENDANGERED.

(a) Total population N_e < 2,000 (corresponding to actual N < 10,000).

(b) Population fragmented:
(i) ≤5 subpopulations with N_e > 500 (N > 2,500) with immigration rates <1 per generation, or
(ii) ≤2 subpopulations with N_e > 1,000 (N > 5,000) with immigration rates <1 per generation.

(c) Census data of >1% annual decline in numbers over past 10 years, or equivalent projected declines based on demographic data after allowing for known cycles.

(d) Population subject to catastrophic crashes: an average of >10% reduction per 5 to 10 years, >20% reduction per 10 to 20 years, or >50% reduction per 50 years, with subpopulations strongly correlated in their fluctuations.

or (2) Observed, inferred, or projected habitat alteration (i.e., degradation, loss, or fragmentation) resulting in characteristics of (1).

or (3) Observed, inferred, or projected commercial exploitation or ecological interactions with introduced species (predators, competitors, pathogens, or parasites) resulting in characteristics of (1).

Prior to any general acceptance, we recommend that these criteria be assessed by comparison of the categorizations they lead to in particular cases with the results of formal viability analyses, and categorizations based on existing methods. This process should help to resolve uncertainties about both the practice of, and results from, our proposals. We expect a system such as this to be relatively robust and of widespread applicability, at the very least for most higher vertebrates. For some invertebrate and plant taxa, different kinds of criteria will need to be developed within the framework of the definitions above. For example, many of these species have very high rates of population growth, short generation times, marked or episodic fluctuations in population size, and high habitat specificity. Under these circumstances, it will be more important to incorporate metapopulation characteristics such as subpopulation persistence times, colonization rates, and the distribution and persistence of suitable habitats into the analysis, which are less significant for most large vertebrate populations (Murphy et al. 1990; Menges 1990).

Change of Status

The status of a population or species with respect to risk of extinction should be up-listed (from unlisted to VULNERABLE, from VULNERABLE to ENDANGERED, or from ENDANGERED to CRITICAL) as soon as current information suggests that the criteria are met. The status of a population or species with respect to risk of extinction should be down-listed (from CRITICAL to ENDANGERED, from ENDANGERED to VULNERABLE, or from VULNERABLE to unlisted) only when the criteria of the lower risk category have been satisfied for a time period equal to that spent in the original category, or if it is shown that past data were inaccurate.

For example, if an isolated population is discovered consisting of 500 individuals and no other information is available on its demography, ecology, or the history of the population or its habitat, this population would initially be classified as ENDANGERED. If management efforts, natural events, or both caused the population to increase so that 10 years later it satisfied the criteria of the VULNERABLE category, the population would not be removed from the ENDANGERED category for a further period of 10 years. This time lag in down-listing prevents frequent up-listing and down-listing of a population or species.

Uncertain or Conflicting Results

Because of uncertainties in parameter estimates, especially those dealing with genetics and environmental

variability and catastrophes, substantial differences may arise in the results from analyses of equal validity performed by different parties. In such cases, we recommend that the criteria for categorizing a species or population should revert to the more qualitative ones outlined above.

Reporting Categories of Threat

To objectively compare categorizations made by different investigators and at different times, we recommend that any published categorization also cite the method used, the source of the data, a date when the data were accurate, and the name of the investigator who made the categorization. If the method was by a formal viability model, then the name and version of the model used should also be included.

Conclusion

Any system of categorizing degrees of threat of extinction inevitably contains arbitrary elements. No single system can adequately cover every possibility for all species. The system we describe here has the advantage of being based on general principles from population biology and can be used to categorize species for which either very little or a great deal of information is available. Although this system may be improved in the future, we feel that its use will help to promote a more uniform recognition of species and populations at risk of premature extinction, and should thereby aid in setting priorities for conservation efforts.

Summary

1. Threatened species categories should highlight species vulnerable to extinction and focus appropriate reaction. They should therefore aim to provide objective, scientifically based assessments of extinction risks.
2. The audience for Red Data Books is diverse. Positive steps to raise public awareness and implement national and international legislation benefit from simple but soundly based categorization systems. More precise information is needed for planning by conservation bodies.
3. An ideal system needs to be simple but flexible in terms of data required. The category definitions should be based on a probabilistic assessment of extinction risk over a specified time interval, including an estimate of error.
4. Definitions of categories are appropriately based on extinction probabilities such as those arising from population viability analysis methods.
5. We recommend three categories, CRITICAL, ENDANGERED, and VULNERABLE, with decreasing probabilities of extinction risk over increasing time periods.
6. For most cases, we recommend development of more qualitative criteria for allocation to categories based on basic principles of population biology. We present some criteria that we believe to be appropriate for many taxa, but are appropriate at least for higher vertebrates.

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