CRANE CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Participants' First Draft Report

Edited by
Claire Mirande, Susie Ellis, and Ulysses Seal

Compiled by the Participants
of a Collaborative Workshop
held 9-15 August 1992
Calgary, Alberta, Canada

A Joint Endeavor of

International Crane Foundation

BirdLife International Crane Specialist Group

Regional Captive Propagation Programs

Calgary Zoological Society

IUCN/SSC Captive Breeding Specialist Group

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CBSG

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Natal Parks Board
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Speedwell Bird Sanctuary
Sylvan Heights Waterfowl
Ueno Zoological Gardens
Wildwood
Zoological Animal Exchange
Zoo Conservation Outreach Group

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SECTION 1

SUMMARY

CRANE
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
EXECUTIVE SUMMARY

Crane (Gruidae) taxa were reviewed taxon-by-taxon to assign a category of threat and to recommend intensive conservation action. The recommendations contained in the Crane Conservation Assessment and Management Plan are based only on conservation criteria; adjustments for political and other constraints will be the responsibility of regional plans.

For this exercise, 30 distinct taxa (species, subspecies, or distinct populations) of Cranes were considered. 22 of the 30 taxa (73%) were assigned to one of three categories of threat, based on the Mace-Lande criteria:

Critical	8 taxa
Endangered	7 taxa
Vulnerable	7 taxa
Secure	8 taxa

The primary threats to Cranes were identified as the following:

Habitat loss	20 taxa
Hunting	11 taxa
Pesticides	6 taxa
Trade	5 taxa
Disease	3 taxa
Fire	3 taxa
Climatic changes	3 taxa
Hurricanes	2 taxa

24 of the 30 taxa (80%) were recommended for Population and Habitat Viability Assessment workshops.

Research was recommended for 27 taxa (90%) in the following categories:

Survey	20 taxa
Taxonomic research	22 taxa
Husbandry	10 taxa

26 of the 30 Crane taxa (86%) were recommended for one of two time-frames for development of captive programs (based in part on Mace-Lande criteria):

Initiate within 0-3 years	15 taxa
Initiate in the future (>3 years)	11 taxa

An additional 4 taxa were not recommended for captive programs.

CRANE CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Introduction.
Reduction and fragmentation of wildlife populations and habitat is occurring at a rapid and accelerating rate. For an increasing number of taxa, the results are small and isolated populations at the 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 will not be quelled, and which will lead to a decreased capacity for all other species 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.

The successful preservation of wild species and ecosystems necessitates development and implementation of active management programs by people and governments living within the range area of the species in question. The recommendations contained within this document are based on conservation need only; adjustments for political and other constraints are the responsibility of regional governmental agencies charged with the preservation of 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 Captive Breeding Specialist Group (CBSG) is to contribute to the development of holistic and viable conservation strategies and management action plans. Toward this goal, CBSG is collaborating with agencies and other Specialist Groups worldwide in the development of Conservation Assessment and Management Plans (CAMPs), both on a global and a regional basis, with the goal of facilitating an integrated approach to species management for conservation.

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

In addition to management in the 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 be used to reinforce wild populations whether by revitalizing populations that are languishing in natural habitats or by re-establishing by translocation 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 captive populations can assist species conservation, 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 regard to disease, logistics, and financial limitations. In the face of the immense extinction crisis facing many insular taxa, these issues must be addressed and resolved within the next several years.

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 the Gruidae Conservation Assessment and Management Plan (CAMP) workshop was to assist in the development of a conservation strategy for Gruidae, and to continue to test the applicability of the Mace-Lande criteria. On 10-15 August, 1992, 26 individuals met in Calgary, Alberta, Canada to review, refine, and develop further conservation strategies for Gruidae. This group consisted of individuals invited to attend by the International Crane Foundation (ICF) and BirdLife International (formerly ICBP) Crane Specialist Group, and represented field biologists, wildlife experts, conservation biologists, academic scientists, and captive managers. Participants and invitees are listed in Section 5, Appendix I.

Participants worked together in small groups to: 1) determine best estimates of the status of all Gruidae s; 2) assign each taxon to a Mace-Lande category of threat; and 3) identify areas of action and information needed for conservation and management purposes.

The assessments and recommendations of each of the working groups for each taxon were circulated to the entire group prior to final consensus by all participants, 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 Crane CAMP workshop were:

1) To review the population status and demographic trends for Gruidae, to test the applicability of the Mace-Lande criteria for threat, and to discuss management options for Gruidae taxa.

2) To provide recommendations for *in situ* and *ex situ* management, research and

information-gathering for all Crane taxa, including: recommendations for PHVA workshops; more intensive management in the wild; survey, taxonomy, husbandry or other specific research.

3) Produce a discussion draft Conservation Assessment and Management Plan for Gruidae, presenting the recommendations from the workshop, for distribution to and review by workshop participants and all parties interested in Crane conservation.

Assignment to Mace-Lande Categories of Threat

All Crane taxa were evaluated on a taxon-by-taxon basis in terms of their current and projected status in the wild to assign priorities for conservation action or information-gathering activities. The workshop participants applied the criteria proposed for the redefinition of the IUCN Red Data Categories proposed by Mace and Lande in their 1991 paper (Section 4). The Mace-Lande scheme assesses threat in terms of a likelihood of extinction within a specified period of time (Table 1). The system defines three categories for threatened taxa:

Critical 50% probability of extinction within five 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 workshop were encouraged to be as quantitative or numerate as possible for two reasons: 1) Conservation Assessment and Management Plans 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 workshop, 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 Crane taxa were not available or were available for taxa within a limited part of their distribution. In all cases, conservative numerical estimates were used. **Where population numbers are estimated, these estimates represent first-attempt, order-of-magnitude guesstimates that are hypotheses for falsification. As such, the workshop participants emphasize that these guesstimates should not be used as an authoritative estimate for any other purpose than was intended by this process.**

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Table 1. MACE-LANDE CATEGORIES AND CRITERIA FOR THREAT

	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 on other characteristics. Information about population trends, fragmentation, range, and environmental stochasticity, real and potential, were also considered.

Numerical information alone was not sufficient for assignment to one of the Mace-Lande categories of threat. For example, based solely on population estimates, a taxon might be assigned to the Vulnerable or Safe category. Knowledge of the current and predicted threats to remaining natural habitat, however, may lead to assignment to a higher category of threat. Mace-Lande categories of threat for the 30 taxa examined during this CAMP exercise are presented in Table 2. Specific taxa within each category are presented in Tables 8-10. In Tables 8 and 9, the cross-fostered population of Whooping crane (*Grus americana*) is considered separately from the wild population. These populations are not considered separately for the purposes of data summary in this document.

Table 2. Threatened Crane taxa - Mace-Lande categories of threat.

MACE-LANDE CATEGORY	NUMBER OF TAXA	PERCENT OF TOTAL
Critical	8	27
Endangered	7	23
Vulnerable	7	23
Safe	8	27
TOTAL	30	100

One of the goals of the CAMP workshop was to test the applicability of the Mace-Lande criteria for threat, which were designed in an attempt to redefine the current IUCN categories of threat. A comparison of Mace-Lande and IUCN classification results is presented in Table 3. Nine of the Crane taxa assigned to a Mace-Lande category of threat are listed as threatened under IUCN classification; 13 taxa assigned to Mace-Lande categories of threat are not listed in the *1990 IUCN Red List of Threatened Animals.*

Table 3. Threatened Cranes of the world - comparison of Mace-Lande and current IUCN categories of threat.

MACE-LANDE	END	VUL	RARE	INDET	K	NOT	TOTAL
Critical	1	0	2	0	1	4	8
Endangered	0	2	3	0	0	2	7
Vulnerable	0	0	0	0	0	7	7
TOTAL	1	2	5	0	1	13	22

Regional Distribution of Threatened Taxa.
Regional distribution of threatened taxa is presented in Table 4. As shown, 36% of threatened Gruidae taxa are found in the African region. Detailed spreadsheets and individual accounts for all taxa are presented in Table 12 in Section 2.

Table 4. Regional distribution of threatened Gruidae taxa.

MACE-LANDE	Africa	Eurasia	C+S Amer	N.America	Australas	SE Asia	TOTAL
Critical	3	2	1	2	0	0	8
Endangered	2	3	0	1	0	1	7
Vulnerable	3	3	0	1	0	0	7
TOTAL	8	8	1	4	0	1	22

Threats Facing Gruidae.
For the purposes of the CAMP process, threats were defined as "immediate or predicted events that are causing or may cause significant population declines." By far, the greatest threats facing Cranes are factors that, with appropriate management, can be minimized if not eliminated - habitat loss, hunting, pesticides, trade, disease, and human-controlled burning of habitat. Other major threats, such as hurricanes and climatic changes, are "Acts of God" and cannot be controlled. Threat data, in terms of Mace-Lande status, are presented in Table 5.

Table 5. Threats facing Cranes according to Mace-Lande status.

MACE-LANDE	Habitat Loss	Hunting	Pesticides	Trade	Disease	Fire	Climate	Hurricanes
Critical	7	4	1	0	1	0	2	2
Endangered	6	4	2	2	1	1	1	0
Vulnerable	7	3	3	3	2	2	0	0
TOTAL	20	11	6	5	4	3	3	2

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 felt to be necessary for conservation. These recommendations, summarized in Table 6, were: Population and Habitat Viability Assessment (PHVA) workshops; ~~wild management~~; survey; taxonomic research; husbandry research and captive programs. PHVA workshops provide a means of assembling available detailed biological information on the respective taxa, evaluating the threats to their habitat, development of management scenarios with immediate and 100-year time-scales, and the formulation of specific adaptive management plans with the aid of simulation models. In many cases, workshop participants determined that the current level of information for a taxa was not adequate for conduction of a PHVA; in those cases, recommendations are listed as "PHVA Pending."

Workshop participants attempted to develop an integrated approach to management and research actions needed for the conservation of Gruidae 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. Management and research recommendations are summarized in Table 6.

Table 6. Gruidae management and research recommendations.

MACE-LANDE	PHVA	SURVEY	TAXONOMIC RESEARCH	HUSBANDRY RESEARCH	CAPTIVE PROGRAMS
Critical	8	6	5	4	7
Endangered	7	6	6	2	7
Vulnerable	7	6	4	4	6
Safe	2	2	7	0	6
TOTAL	24	20	22	10	26

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Captive Program Recommendations.
For many of the Gruidae taxa, it was determined that a captive component would be necessary to contribute to the maintenance of long-term viable populations. ~~It is proposed that,~~ When captive populations can assist species conservation, captive and wild populations ~~should~~ be intensively and interactively managed with interchanges of animals occurring as needed and as feasible. There may be problems with interchange between captive and wild populations with regard to disease, logistics, and financial limitations.

It is essential to note that the establishment of self-sustaining captive populations is not the only management option available for Cranes, and that, in fact, most crane populations have the ability to recover if the reasons for the decline are controlled. Incorporating "captive propagation technology" or "field application of captive propagation techniques" (e.g., double-clutching or single egg removal, translocation, rearing at release sites, or captive-rearing eggs collected from the wild and releasing young, or supplemental feeding) with field management techniques is also valuable. In some cases, these techniques may be more feasible than establishing new captive programs with several threatened species. The goal of the captive Whooping crane population management is to supply adequate numbers of young for release programs, since most of the problems causing their decline have been adequately resolved.

During the CAMP workshop, all Gruidae taxa were evaluated relative to their current need for captive propagation. Recommendations were based upon a number of variables, including: 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 mentioned above. Based on all of the above considerations, in addition to threats, trends, and Mace-Lande assessment, recommendations for captive programs were made. Twenty-six (86%) of the 30 taxa considered were recommended for captive programs. These recommendations, by category of threat, are presented in Table 7. Recommendations for levels of programs are presented in the spreadsheets in Section 2. Information concerning the current populations of Gruidae in captivity (according to the International Species Information System) are presented in Section 3.

Table 7. Captive program recommendations for Cranes by Mace-Lande threat category.

MACE-LANDE	Initiate immediately 0-3 yrs	Initiate future > 3 yrs	Not currently recommended
Critical	7	0	1
Endangered	5	2	0
Vulnerable	3	3	1
Safe	0	6	2
TOTAL	15	11	4

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SECTION 2

SPREADSHEET CATEGORY DEFINITIONS, SPREADSHEETS, AND TAXON DATA SHEETS

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.

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.

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.
A: < 50,000 sq km
AA:< 50,000 sq km and on a geographic island

M/L STS: Status according to Mace/Lande criteria (see attached explanation).
C = Critical
E = Endangered
V = Vulnerable
S = Secure

THREATS: Immediate or predicted events that are or may cause significant population declines.

C = Climate
D = Disease
F = Fire (controlled burns for agriculture)
G = Genetic problems, including inbreeding
H = Hunting for food or other purposes
Hyb = Hybridization
I = Human interference or disturbance
L = Loss of habitat
P = Predation
Ps= Pesticides
Pl= Powerlines
Po= Poisoning
Pu= Pollution
S = Catastrophic events
 Sh: hurricane
 Spu: pollution (acute)
T = Trade for the live animal market

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
S = Survey or monitoring
H = Husbandry research

CAPTIVE PROGRAMS

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

REC: Level of Captive Program

- **I-1** = **Intensive - 1.** Captive population should be developed and managed that is sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). Program should be developed within 3 years. This is an emergency program based on the present availability of genetically diverse founders.

- **I-2** = **Intensive - 2.** Initiate a captive program in the future, within 3 or more years. Captive population should be developed and managed that is a nucleus of 50-100 individuals organized with the aim to represent as much of the wild gene pool as possible. This program may require periodic importation of individuals from the wild population to maintain this high level of genetic diversity in a limited captive population. This type of program should be viewed as protection against potential extirpation of wild populations.

- **N** = **No.** A captive program is not currently recommended

- **P** = **Pending.** A captive program is not currently recommended but may be reconsidered pending further data

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.

Table 7. Critical Gruidae Taxa

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
10	Anthropoides	virgo (African pop.)	NW Africa resident	< 50	3?	D	A	C	H/Ps?	Y*	Y	T/S/N	0		I-1
12	Anthropoides	paridisea	South Africa & Namibia resident	3000-5000	2	D	C	C	L/Po	Y	Y	N/S/N	524+		I-1
14	Bugeranus	carunculatus (Ethiopian pop.)	Ethiopia resident	< 200	1	D	B	C	L/C/H	Y	Y	T/S/H	0		N
18	Grus	leucogeranus (Central pop.)	Siberia/ Bharatpur, India	6-10	1	D	C	C	L/H/P/G	Y	Y	T/S/H	3		I-1
19	Grus	leucogeranus (Western pop.)	Siberia/ S. Caspian, Iran	10-11	1	S?	UNK	C	L/H/P/G	Y	Y	T/S/H	0		I-1
23	Grus	canadensis nesiotes	W Cuba (incl. Isle of Pines) resident	< 100	2	D	AA	C	L	Y	Y	N/S/N	0		I-1
27	Grus	canadensis pulla	SE Mississippi (USA) resident	120	1	D	A	C	L/Sh/Pu	Y '92	Y*	T/N/N	83		I-1
38	Grus	americana (natural pop.)	Wood Buffalo Nat'l Park/ Aransas NWR	150	1	I	A	C	D/C/Pr/L/ Sh/Pl/Spu	8/91	Y	N/N/H	98		I-1
39	Grus	americana (cross-fostered pop.)	Gray's Lake, ID/ Rio Grande Valley, NM	12	1	D	A	C	L/D/Pl	8/91	N	N/N/N	--		*

Table 8. Endangered Gruidae Taxa.

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
4	Balearica	regulorum regulorum	Zambia to South Africa resident	5,000	?	D	D	E	Po/L/H	Y	Y	T/S/N	21		I-1
7	Balearica	pavonina pavonina	Senegal to N Cameroon & W Chad resident	15-20,000	8+	D	C	E	H/T/L/C/ Ps	Y	Y	N/S/H	123		I-1
17	Grus	leucogeranus (Eastern pop.)	Siberia/Poyang Lake, Yangtze Basin, China	2500-3000	1	S	E	E	L/H	Y	Y	T/S/H	87		I-1
26	Grus	canadensis pratensis (Okeefenokee pop.)	S Georgia & N Florida resident	200-400	1	S	A	E		Y	N	T/N/N	81		I-2
32	Grus	antigone sharpi	SE Asia (Vietnam, Laos, Cambodia, Burma, Philippines)	1150	2	D	C	E	L/T/H	Y	Y	T/S/N	45+		I-1
42	Grus	japonensis (Mainland pop.)	NE Mongolia, N China, & E Siberia, Korea, E. China	1000-1100	2-3?	D	D	E	L/Ps/F	Y	Y	T/S/N	650		I-1
43	Grus	japonensis (Japanese pop.)	NE Hokkaido (Japan) resident	502	1	I	AA	E	L/D/Pl	Y	Y	T/S/N	50		I-2

Table 9. Vulnerable Gruidae Taxa.

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
5	Balearica	regulorum gibbericeps	E Zaire & Kenya to Tanzania resident	> 95,000	?	D	D	V	L/H/T	Y	Y	T/S/N	293		I-2
8	Balearica	pavonina ceciliae	Sudan & Ethiopia resident	50-70,000	?	S	D	V	T/L/H	Y	Y	N/S/H	?		N
15	Bugeranus	carunculatus(Southern pop.)	Zambia to South Africa resident	8000-10000	5-6	S	D	V	H/L/Sf/ Pl	Y	Y	T/S/H	191		I-1
30	Grus	antigone antigone	N Indian Subcontinent resident	25,000	2	D	D	V	L/Ps/T?	Y	Y	T/S/N	138		I-1
34	Grus	vipio	Siberia, Mongolia, & N China (Hwang & Yangtze Rivers);/ E. China & Korea, Arasaki & Kyushu, S Japan	5,000	1	S/I	UNK	V	D/Ps/L/Sf	Y	Y	N/S/N	300?		I-1
36	Grus	monachus	Siberia, SC China, and Yangtze valley, and S. Korea; Kyushu and Hohshu Japan	11,000	1	I-Jap D-China	C/A	V	D/L/Po	Y	Y	N/S/H	100		I-2
40	Grus	nigricollis	Ladakh (India) to Qinghai (China), SW China, NE India, Bhutan and S Himalayas (Bhutan & frontier division of Subansiri Predash)	5000-6000	4	S	UNK	V	L	Y	Y	T/S/H	75		I-2

Table 10. Safe Gruidae Taxa.

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
11	Anthropoides	virgo (Asian pop.)	S Ukraine to China, Pak, India, Chad, Sudan, Ethiopia	100,000+	3	I	E	S	H/T	Y	Y	T/S/N	216		I-2
21	Grus	canadensis canadensis	Siberia & N North America/ C.Cal, E. N Mex, NW Texas, to Chihuahua C. Mexico	400,000+	2+	I/S	E	S	L	N	N	T/N/N	10		N
22	Grus	canadensis tabida	Canada & N United States/ Florida, Rio Grande, New Mexico to N. Chihuahua, Calif.	45-50,000	4	I	E	S	L	N	N	T/N/N	157		I-2
25	Grus	canadensis pratensis (Florida pop.)	Florida resident	8,000	1	S	B/C	S	L	N	N	T/N/N	217		I-2
28	Grus	canadensis rowani	C Canada, E & W Texas, W. La., E.New Mexico to Chihuahua, Mexico	60-100,000	1	S	E	S		N	N	T/N/N	2		N
31	Grus	antigone gilli	N Australia (resident)	5000-10000	1	I	B	S	Hyb	N	N	T/N/N (Hyb)	20+		I-2
33	Grus	rubicundus	Australia & New Guinea resident	20-25,000	2	S	E	S	L/Hyb	N	N	N/N/N (Hyb/SD)	23		I-2
35	Grus	grus	N Eurasia, Mediterranean region to NE & NW Africa; Persian Gulf; India, S. China to Indo-China, Burma & Assam	> 100,000	3+	I	E	S	H/L/Ps	Y*	Y	T/S/N	211		I-2

Table 11. All Gruidae Taxa.

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
1	GRUIFORMES														
2	GRUIDAE														
3	Balearica	regulorum	E Zaire & Kenya to South Africa resident												
4	Balearica	regulorum regulorum	Zambia to South Africa resident	5,000	?	D	D	E	Po/L/H	Y	Y	T/S/N	21	1	I-1
5	Balearica	regulorum gibbericeps	E Zaire & Kenya to Tanzania resident	> 95,000	?	D	D	V	L/H/T	Y	Y	T/S/N	293	1	I-2
6	Balearica	pavonina	Senegal to Sudan & Ethiopia resident												
7	Balearica	pavonina pavonina	Senegal to N Cameroon & W Chad resident	15-20,000	8+	D	C	E	H/T/L/C/ Ps	Y	Y	N/S/H	123	2	I-1
8	Balearica	pavonina ceciliae	Sudan & Ethiopia resident	50-70,000	?	S	D	V	T/L/H	Y	Y	N/S/H	?	2	N
9	Anthropoides	virgo	S Ukraine to China/ NW Africa, Pak, India, Chad, Sudan, Ethiopia												
10	Anthropoides	virgo (African pop.)	NW Africa resident	< 50	3?	D	A	C	H/Ps?	Y*	Y	T/S/N	0	1	I-1
11	Anthropoides	virgo (Asian pop.)	S Ukraine to China, Pak, India, Chad, Sudan, Ethiopia	100,000+	3	I	E	S	H/T	Y	Y	T/S/N	216	1	I-2
12	Anthropoides	paridisea	South Africa & Namibia resident	3000-5000	2	D	C	C	L/Po	Y	Y	N/S/N	524+	1	I-1
13	Bugeranus	carunculatus	Ethiopia & Zambia to South Africa resident												

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
14	Bugeranus	carunculatus (Ethiopian pop.)	Ethiopia resident	< 200	1	D	B	C	L/C/H	Y	Y	T/S/H	0	2	N
15	Bugeranus	carunculatus (Southern pop.)	Zambia to South Africa resident	8000-10000	5-6	S	D	V	H/L/Sf/ Pl	Y	Y	T/S/H	191	2	I-1
16	Grus	leucogeranus	Siberia/SE China, India and Iran												
17	Grus	leucogeranus (Eastern pop.)	Siberia/Poyang Lake, Yangtze Basin, China	2500-3000	1	S	E	E	L/H	Y	Y	T/S/H	87	2	I-1
18	Grus	leucogeranus (Central pop.)	Siberia/ Bharatpur, India	6-10	1	D	C	C	L/H/P/G	Y	Y		3		
19	Grus	leucogeranus (Western pop.)	Siberia/ S. Caspian, Iran	10-11	1	S?	UNK	C	L/H/P/G	Y	Y		0		
20	Grus	canadensis	North America, Cuba, & Siberia S & W U.S. and Mexico												
21	Grus	canadensis canadensis	Siberia & N North America/ C.Cal, E. N Mex, NW Texas, to Chihuahua C. Mexico	400,000+	2+	I/S	E	S	L	N	N	T/N/N	10	1	N
22	Grus	canadensis tabida	Canada & N United States/ Florida, Rio Grande, New Mexico to N. Chihuahua, Calif.	45-50,000	4	I	E	S	L	N	N	T/N/N	157	1	I-2
23	Grus	canadensis nesiotes	W Cuba (incl. Isle of Pines) resident	< 100	2	D	AA	C	L	Y	Y	N/S/N	0	1	I-1
24	Grus	canadensis pratensis	S Georgia & Florida (USA) resident												
25	Grus	canadensis pratensis (Florida pop.)	Florida resident	8,000	1	S	B/C	S	L	N	N	T/N/N	217	1	I-2

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
26	Grus	canadensis pratensis (Okeefenokee pop.)	S Georgia & N Florida resident	200-400	1	S	A	E		Y	N	T/N/N	81	1	I-2
27	Grus	canadensis pulla	SE Mississippi (USA) resident	120	1	D	A	C	L/Sh/Pu	Y '92	Y*	T/N/N	83	1	I-1
28	Grus	canadensis rowani	C Canada, E & W Texas, W. La., E.New Mexico to Chihuahua, Mexico	60-100,000	1	S	E	S		N	N	T/N/N	2	1	N
29	Grus	antigone	Tropical Asia & N Australia resident												
30	Grus	antigone antigone	N Indian Subcontinent resident	25,000	2	D	D	V	L/Ps/T?	Y	Y	T/S/N	138	1	I-2
31	Grus	antigone gilli	N Australia (resident)	5000-10000	1	I	B	S	Hyb	N	N	T/N/N (Hyb)	20+	1	I-2
32	Grus	antigone sharpi	SE Asia (Vietnam, Laos, Cambodia, Burma, Phillipines)	1150	2	D	C	E	L/T/H	Y	Y	T/S/N	45+	1	I-1
33	Grus	rubicundus	Australia & New Guinea resident	20-25,000	2	S	E	S	L/Hyb	N	N	N/N/N (Hyb/SD)	23	1	I-2
34	Grus	vipio	Siberia, Mongolia, & N China (Hwang & Yangtze Rivers) / E. China & Korea, Arasaki & Kyushu, S Japan	5,000	1	S/I	UNK	V	D/Ps/L/Sf	Y	Y	N/S/N	300?	1	I-1
35	Grus	grus	N Eurasia, Mediterranean region to NE & NW Africa; Persian Gulf; India, S. China to Indo-China, Burma & Assam	> 100,000	3+	I	E	S	H/L/Ps	Y*	Y	T/S/N	211	1	I-2
36	Grus	monachus	Siberia, SC China, and Yangtze valley, and S. Korea; Kyushu and Hohshu Japan	11,000	1	I-Jap D-China	C/A	V	D/L/Po	Y	Y	N/S/H	100	2	I-2

	TAXON		WILD POPULATION									RESEARCH	CAPTIVE PROGRAM		
	SCIENTIFIC NAME		BREEDING/ WINTERING RANGE	EST #	NUM POP	TRND	AREA	M/L STS	THRTS	PVA	WILD MGMT	TAX/SRV/HUSB	NUM	DIFF	CAP REC
37	Grus	americana	Wood Buffalo Nat'l Park (Canada), Aransas NWR, Coastal Texas USA												
38	Grus	americana (natural pop.)	Wood Buffalo Nat'l Park/ Aransas NWR	150	1	I	A	C	D/C/P/L/ Sh/Pl/Spu	8/91	Y	N/N/H	98	2	I-1
39	Grus	americana (cross-fostered pop.)	Gray's Lake, ID/ Rio Grande Valley, NM	12	1	D	A	C	L/D/Pl	8/91	N	N/N/N	--	2	*
40	Grus	nigricollis	Ladakh (India) to Qinghai (China), SW China, NE India, Bhutan and S Himalayas (Bhutan & frontier division of Subansiri Predash)	5000-6000	4	S	UNK	V	L	Y	Y	T/S/H	75	1	I-2
41	Grus	japonensis	NE Mongolia to N Japan, Korea, E. China and Japan												
42	Grus	japonensis (Mainland pop.)	NE Mongolia, N China, & E Siberia, Korea, E. China	1000-1100	2-3?	D	D	E	L/Ps/Sf	Y	Y	T/S/N	650	2	I-1
43	Grus	japonensis (Japanese pop.)	NE Hokkaido (Japan) resident	502	1	I	AA	E	L/D/Pl	Y	Y	T/S/N	50	2	I-2

*SEE TAXON DATA SHEET

Participants' First Draft

TAXON DATA SHEET

SPECIES Gray Crowned Crane *Balearica regulorum*

Subspecies East African Crowned Crane *B.r. gibbericeps*
South African Crowned Crane *B.r. regulorum*

CITES
APPENDIX II

USFWS

IUCN
no special status

Mace/Lande (Species)
Vulnerable

Subspecies
E. African: Vulnerable
S. African: Endangered (100's)

Distribution
B. r. gibbericeps: E Africa, E Congo, Uganda to Kenya & Tanganyika
B. r. regulorum: South Africa, Zimbabwe

Population Size (Est.)
B. r. gibbericeps: 100,000
B. r. regulorum: 100's

 # Populations
2

Area - sq k
>1,000,000

Population Trend
Decreasing due to human encroachment and dwindling wetlands. Siegfried's roadside transect in RSA is a good place to start comparing modern RSA population.

Threats
Capture for pets and wildlife trade; disturbance of nests documented in E. Africa; habitat destruction due to drought-related human need for more land for farming. Combination of rapidly rising human population, rising population of domestic animals (cattle damage vegetation, destroy nesting areas), and increasing numbers of wild animals in nature reserves.

Trade Data
Lots of trade. Forbidding export will be one of the goals of the African Crane and Wetland Workshop in Maun, Botswana in 1993.

Comments
Pomeroy, D. 1980. Aspects of the ecology of crowned Cranes *B.r. gibbericeps* in Uganda. Scopus 4:29-35; Siegfried, W.R. 1966? paper about roadside counts of Cranes in RSA; Konrad, P. 1987. See *1983 ICW Proceedings*, P. Mafabi, Uganda, in progress. This species breeds well in captivity when properly housed. Possibly should slow their reproduction rate to make more space for *B. pavonina*.

Field Studies (Done, In progress - Who?)
The Gichuki's (Wildlife Club of Kenya) Kenya Crane Count in progress. Walkinshaw, L.H., 1965, The African Crowned Cranes.

PVA

Wild Management
In the future/will probably need to address this problem.

Research Needed (Surv, Tax, Husb)
Monitoring to determine population trend. Survey and management to designate more protected areas, educate locals about the birds.

Captive Population(s)
ISIS data indicates 106.109.78. See Gruidae Advisory Group report of Bohmke & Johnson for North American population estimate. Does not include substantial numbers in the private sector.

Captive Program
Significant numbers reproducing in captivity. Need to start studbook to try to avoid hybrids. Susie Haeffner of the Denver Zoo may initiate. Very strictly protected in S. Africa. About 100 birds in private collections in Thailand, small numbers (30?) in China. Enough birds to try 90/100 II(?).

TAXON DATA SHEET

SPECIES Black Crowned Crane *Balearica pavonina*

Subspecies West African Crowned Crane *B.p. pavonina*
Sudan Crowned Crane *B.p. ceciliae*

CITES
APPENDIX II

USFWS

IUCN
no special status

Mace/Lande (Species)
Endangered (10 generations)

Subspecies
both are Endangered

Distribution
B.p. pavonina: West Africa
B.p. ceciliae: Central Africa, largest concentration in Sudan.

Population Size (Est.)
B.p. pavonina: 15-20,000
B.p. ceciliae: 50-70,000
(poor data due to wars)

 # Populations
2

Area - sq k
>1,000,000

Population Trend
Still fairly high (10,000's) in Sudan and Ethiopia. Declining rapidly in W Africa, *B.p. pavonina* almost extinct in Nigeria.

Threats
Drought, expanding desertification and habitat destruction due to expanding human population, trapping for sale to dealers. Pesticide poisoning due to aerial spraying for *Quelia* control.

Trade Data
Has been a real problem in Nigeria, trade to dealers. Problem for B.p.pavonia in Saudi Arabia.

Comments
Threatened and probably extinct in parts of its range, need more emphasis on captive reproduction. Most nest in wetlands with heavy vegetation and feed on insects near other wildlife in grasslands.

Field Studies (Done, In progress - Who?)
Walkinshaw, L.H. 1965. The African crowned Cranes. Auk ?
Fry. 1981. See Crane Research Around the World.

PVA

Wild Management
More intensive wild management needed.

Research Needed (Surv, Tax, Husb)
Population trend monitoring at standardized sites. Survey, management including designation of protected areas. Husbandry research also needed.

Captive Population(s)
42.55.26; 250+, probably much higher (est. by S. Swengel & G. Archibald).
B.p.p. most common in captivity, but has low reproduction. Korn <prolific: <attention in private sector.

Captive Program
Need to establish correct ID of species to avoid hybrids. Need to house more pairs alone instead of in flocks. Enough birds to 90/100 II(?).

TAXON DATA SHEET

SPECIES Demoiselle Crane *Anthropoides virgo*

Subspecies
unknown if resident pop. in NW Africa is taxonomically distinct.

CITES

USFWS

IUCN
no special status

Mace/Lande (Species)
Vulnerable

Subspecies

Distribution
Very wide distribution in temperate Eurasia from S. Ukraine to NE China in breeding season, S. Asia and NE Africa in winter. Possibly a small resident population in Morocco; previously broadly distributed thru N. Africa. Saudi Arabians studying new migration route.

Population Size (Est.)
> 100,000

 # Populations
small populations

Area - sq k

Population Trend
Increasing in some areas like Khazakstan; may be declining in Ukraine.

Threats
Increasing human population and habitat usage for agriculture on wintering grounds, esp. India and NE Africa. Hunted during migration in S. Asia and perhaps Middle East; shot by 100s due to automatic weapons, especially in Hindu Kush Mts. Conflict w/ humans due to crop depredation. Ukrainian population collected for European zoos.

Trade Data

Comments
Breed in grasslands around lakes. Nest in dry areas, also on shallow lakes. Nomadic depending on rains. Co-adapted to humans, breeding in agricultural fields. Now in conflict to agriculture in Khazakstan - justified, can do damage. Good working group in Pakistan. Recent workshop on Demi's in Russia.

Field Studies (Done, In progress - Who?)
Stehlik. 1969. A breeding study of Demoiselle Cranes (in captivity).
Winter, S. 1991. Excellent study of wild Demoiselle breeding biology in Ukraine, looks at effects of egg collection for zoos.

PVA

Wild Management

Research Needed (Surv, Tax, Husb)
Standardized monitoring program somewhere in Asia to establish pop. trend.

Captive Population(s)
73.83.43 (199) reported to ISIS -
T. Schneider did analysis.
Large numbers in private sector (>200);
popular, easy to keep, but problems with unknown lineages. Prohibited in some countries.

Captive Program
need management; provide birds thru captive breeding.

TAXON DATA SHEET

SPECIES Blue Crane *Anthropoides paradisea*

Subspecies

CITES

USFWS

IUCN
no special status

Mace/Lande (Species)
Vulnerable

Subspecies

Distribution
RSA, E Namibia, S Botswana, perhaps S Mozambique, parts of neighboring countries.

Population Size (Est.)
> 10,000

 # Populations
2 - S. Africa & Namibia

Area - sq k

Population Trend
Conflicting data. Large pop. in RSA & small, isolated pop. in Namibia. S. African Crane Census suggests decline, but David Allan's roadside transects suggest increase since Siegfried's similar work.

Threats
Poisoning a serious problem. Grassland conversion by paper companies to pine & eucalyptus plantations for lumber production in 2005.

Trade Data
Lots of trade likely. Export & capture forbidden in RSA since 70s.

Comments
National Bird of RSA. Allan's study in abundant area by roadside transects suggests increase since Siegfried's transects, while the S. African Crane Census (Filmer & Holtshausen, also in ICF Bugle August 1987) suggests decline. Allan's method of search may have led to higher rates of Cranes seen/road mile than Siegfried given same pop. size. Allan's results still encouraging; provide excellent data on habitat use, with suggestion for agriculture methods favorable to Blue Cranes. Nest in dry areas. Chicks feed on seeds & insects. Flocks up to 1,000 in large fields. Farmers put out poisoned grain--up to 150 killed at one time. Still abundant near Cape Town.

Field Studies (Done, In progress - Who?)
Allan's study on pop. rates/road mile and habitat usage; Van Ee's study of captive breeding; S.A. Crane Census (Bokmakierie, Bugle).

PVA

Wild Management
Implementation of Allan's ideas to improve agric. fields for Blue Cranes by RSA Govt would help. Control poisoning.

Research Needed (Surv, Tax, Husb)
Repeat Allan's roadside transect at five year intervals to determine pop. trend in RSA, the Blue Crane's stronghold.

Captive Population(s)
ISIS - 51.53.20; 5% wild born.
700+ est. (Swengel & Archibald)
Allan censused >400 in RSA captivity.
< 100 in Europe; 70 in private US collections.
Regional studbook keeper in 12-18 months.

Captive Program
Need to manage imports; more effort at mgmt in private sector.

TAXON DATA SHEET

SPECIES Wattled Crane *Bugeranus carunculatus*

Subspecies
(see Krajewski's paper)

CITES
APPENDIX II

USFWS

IUCN
Vulnerable

Mace/Lande (Species)
Vulnerable

Subspecies

Distribution
Most in southern Africa: RSA (200 stable); Zambezi River delta (2,000); small pops. in Ethiopia (scattered pairs), Angola, Zaire, Zambia, Zimbabwe, Malawi, Namibia, Botswana, and Mozambique.

Population Size (Est.)
8,000 - 10,000

 # Populations
2

Area - sq K

Population Trend
Declining throughout range. Degree of movement between populations is unknown and makes counting difficult.

Threats
Habitat loss due to the drought, cattle farming, economic development in Botswana, overpopulation, and the timber industry in S. Africa. Hunting, collisions with powerlines, loss of wetlands, and fire.

Trade Data
Little or no trade pressure.

Comments
International Studbook has not recorded any additional wild caught outside of Africa since 1985. S Africa (Durban) has been collecting 1 egg from 2 egg clutches to build a captive population for breeding.

Field Studies (Done, In progress - Who?)
West did several; Barnes wrote an excellent paper recently about breeding biology in S. Africa; Konrad has studied Wattleds in the Kafue flats; counted in S.A. Crane Census. Also R. Bousfield, Botswana; C. Hines, Namibia; D.N. Johnson and W. Tarbotan, S Africa; P.J. Mundy, Zimbabwe; H. Chabwela (WWF Wetland Project), Zambia.

PVA

Wild Management

Research Needed (Surv, Tax, Husb)
Inventory and protection of small wetlands used by Cranes. Need to coordinate counts in SC Africa (Botswana, Zaire, etc.) to determine pop.; need better data in Africa.

Captive Population(s)
85.94.12 (1991)
N America 37.43.2 (82)
China 7.7.5 (19); 13 at Beijing Zoo.
difficult to breed in captivity--high egg breakage; most pinioned; wild caught males do not adapt easily to standard AI (captive OK); disturbance.
most wild caught females are egg producers.

Captive Program
International Program
N America SSP 1989

TAXON DATA SHEET

SPECIES Siberian Crane *Grus leucogeranus*

CITES
APPENDIX I

USFWS
Endangered

IUCN
Endangered

Mace/Lande (Species)
Endangered

Subspecies

Distribution
See Sauey's PhD. N Siberia 65-72°N during summer, juv. in E Asia perhaps summer 45-55°N. E population separated from W one(s) by 1000s of km. W population in Ob River area & perhaps a small group west of Urals. Winter in SE China, India & N Iran.

Population Size (Est.)
China approx. 2500;
India pop. declined from 200 to 6 from 1965-91.
Iran avg. 9-11 birds since 1984.

 # Populations
3

Area - sq K

Population Trend
Declining. 95% decrease in W Siberia/India population since 1965. Iran winter pop. small & holding at present, but extinction is highly probable with no additional intervention. Chinese wintering pop. varies according to counting methodology & degree of clustering of Cranes--trend unknown, but probably increasing.

Threats
Wintering & staging habitat loss in India, Afghanistan, Pakistan & China. Three Gorges Dam would affect 99% of world pop., could lose 50% per G. Archibald. Poaching in China likely (perhaps documented) during winter. Poaching rare in breeding areas. Hunting in Pakistan & Afghanistan. Very highly specialized: sensitive to change, loss of staging areas. Predation by crows important if very small numbers.

Trade Data

Comments
Much of what is known about wild Sibes has been learned by Russians in just past few years, hasn't reached W print media. Bonn Convention wants to help develop an agreement between all the countries with meetings every 2 years to develop and update a recovery plan. To save the India or Iran pop., adult mortality (primarily from hunting) must be controlled immediately & numbers bolstered. Chances of saving the pops. are low even with intense, immediate efforts.

Field Studies (Done, In progress - Who?)
Sorokin and Flint have studied both populations. Other studies are in progress; Archibald knows who is studying them. Jim Harris & K. Ozaki have counted Sibes in China, & the Chinese monitor the population each year. Studied in Iran by Tavakoli. Studied in India by several people, esp. Ron Sauey (1985 Ph.D.). Several 1987 ICW papers about staging in NE China. Survey in Kunovat: 3 pair & 1 lone bird in 1992.

PVA
First conducted at the Crane Conservation Workshop in Calgary, August 1992. Will be published. Sorokin will draft a recovery plan & should organize meetings to include input from other regions & insure implementation.

Wild Management
Kunovat Reserve

Research Needed (Surv, Tax, Husb)
Find where Iran wintering population breeds. Does India population still stage at Lake Ab-i-estada in Afghanistan? Do Sibes winter at more than one site in India? Husbandry research needed. Problems encountered include: poor reproduction in imprinted founders collected as eggs & hand-reared, late age of sexual maturity, and release techniques need to be developed and refined.

Captive Population(s)
41.25.27 (83) based on V. Panchenko's International Studbook. This includes 19 Chinese birds.

Captive Program
Beijing Zoo, ICF, Oka, Moscow Zoo, Vogelpark Walsrode, Tama Zoo. GASP initiated in August 1992; needs to be completed & recommendations made on pairings & transfers.

TAXON DATA SHEET

SPECIES Sandhill Crane *Grus canadensis*

Subspecies Mississippi Sandhill Crane *G. c. pulla*

CITES	USFWS	IUCN
Endangered	Endangered	Endangered

Mace/Lande (Species)	Subspecies
Secure	Critical

Distribution
SE Mississippi (Jackson County), USA

Population Size (Est.)	# Populations	Area - sq K
120	1	A

Population Trend
The wild population without augmentation is decreasing. The reported increase is due annual releases, but reproduction in wild is well below replacement level.

Threats
Small habitat size leaves them vulnerable to catastrophes. Genetic bottleneck. Poor reproduction rate that baffles biologists, leaving them unable to solve the problem. Habitat loss, hurricanes, and pollution also threaten this population.

Trade Data
Almost no trade, except legitimate release program transfers.

Comments
Poor reproduction, hatchability, chick survival in wild. Question on subspecific status. Influence of genetic material may help.

Field Studies (Done, In progress - Who?)
The MSHC Recovery Plan (1990) is an excellent summary of knowledge on this Crane. Valentine has done many studies. The Crane Workshops have several release program studies. The MSHC National Wildlife Refuge is studying pesticides, habitat preferences, dispersal, and other things related to breeding success (see Hereford).

PVA
Planned for Sept. 1992.

Wild Management
additional population (could be Okeefenokee, depending on taxonomy study)

Research Needed (Surv, Tax, Husb)
Causes of poor reproduction in wild -- in progress. Taxonomic distinction from other populations.

Captive Population(s)
Patuxent and Front Royal 2.2
Patuxent breeding for reintroduction
19.14.48

Captive Program
Patuxent and Front Royal
90/100 (I)

TAXON DATA SHEET

SPECIES Sandhill Crane *Grus canadensis*

Subspecies Canadian Sandhill Crane *G. c. rowani*
Tacha and others question the validity of this subspecies. Besides a marker gene in Lesser Sandhills in Alaska that *G. c. rowani* sampled by Gaines (1985) lacked, there is no way to separate the two consistently.

CITES

USFWS

IUCN
no special status

Mace/Lande (Species)
Secure

Subspecies
Perhaps vulnerable due to high hunting pressure.

Distribution
50° - 55° N (60°?) in western Canada in summer. Platte River during migration. California and Texas in winter.

Population Size (Est.)
60,000 - 100,000

 # Populations
1

Area - sq K
A

Population Trend
Unknown, since it is difficult to distinguish from Lesser. Only studies done by the same methods in different years could even attempt to answer this question. If any subspecies on mainland N America is declining, it is this one.

Threats
No taxa threatening dangers. This subspecies is exposed to the most hunting days/Crane of any subspecies due to its distribution.

Trade Data

Comments
The Greater-Canadian-Lesser Sandhill complex is probably a cline with no stepwise changes in characters and no way to distinguish them reliably (except Greater vs. Lesser). Tacha demonstrated panmictic pairing of three ssp.

Field Studies (Done, In progress - Who?)
Tacha et al. at least 10 published papers, esp. in JWM.
Tacha's Ph.D. contains much of this info.
Walkinshaw. 1949. <u>The Sandhill Cranes</u>

PVA
No

Wild Management
No

Research Needed (Surv, Tax, Husb)
Taxonomic difference between Greater, Canadian, & Lesser subspecies. Establish DNA bank -- send blood to Krajewski.

Captive Population(s)
2 at Patuxent

Captive Program
Eliminate

TAXON DATA SHEET

SPECIES Sandhill Crane *Grus canadensis*

Subspecies Greater Sandhill Crane *G. c. tabida*

CITES

USFWS

IUCN
no special status

Mace/Lande (Species)
Secure

Subspecies
Secure

Distribution
W Great Lakes region and N prairie region of east N America and 40° - 50° N in Rocky Mountains and Pacific Northwest in summer. California, Arizona to Texas, Louisiana, and Indiana to Florida (mainly Georgia and Florida) in winter.

Population Size (Est.)
45,000 - 55,000 breeding (35,000 in E USA, 20,000 in W USA)

 # Populations
4

Area - sq K
>1,000,000

Population Trend
Increasing rapidly in east.

Threats
None. Wetland destruction, especially in Florida and California.

Trade Data

Comments
Hunted in western N America.

Field Studies (Done, In progress - Who?)
Drewien 1970 (Ph.D.); Voss 1974 (M.S.); Howard 1977 (M.S.); Bennett 1978 (M.S.); Walkinshaw 1949 (The Sandhill Cranes) and many Michigan studies; Hoffman -- several studies in Michigan; Urbanek -- several studies in Michigan, including releases; Nesbitt and Bennett have studied wintering flocks; Littlefield and Ryder (west); dozens of others.

PVA
No

Wild Management
No

Research Needed (Surv, Tax, Husb)
Use as surrogate species for winter reintroduction experiments would be valuable. Taxonomic distinction from other subspecies.

Captive Population(s)
157 in ISIS
149 in North America; 6 in Europe;
5 in Asia; 1 in South America.
24 w/living offspring; most founders at Patuxent.

Captive Program
Eliminate

TAXON DATA SHEET

SPECIES Sandhill Crane *Grus canadensis*

Subspecies Lesser Sandhill Crane *G. c. canadensis*

CITES
APPENDIX II

USFWS

IUCN
no special status

Mace/Lande (Species)
Secure

Subspecies
Secure

Distribution
Breeds NW Canada, Alaska, and NE Siberia. Winters California to Texas. High proportion stages at Platte River in spring.

Population Size (Est.)
400,000+

 # Populations
2+

Area - sq K
> 100,000,000

Population Trend
Possibly increasing, but improvements in Platte River aerial counts may have started too recently to make meaningful trend analysis possible. Probably stable.

Threats
Platte River staging area habitat loss, and winter habitat degradation. Drought on Texas - New Mexico wintering grounds would affect 80% of the subspecies.

Trade Data

Comments
Probably not a valid subspecies.

Field Studies (Done, In progress - Who?)
Boise, Alaska; Tacha et al., Saskatchewan, Platte - wintering; Glen Gaines, genetics; Walkinshaw, Banks Island; Lewis, SE Central flyway; Pogson, California; Herter, Copper River Delta; Fred , diet in Texas.

PVA
No

Wild Management
No

Research Needed (Surv, Tax, Husb)
Taxonomic difference between Lesser, Canadian, & Greater subspecies.

Captive Population(s)
10

Captive Program
Eliminate.

TAXON DATA SHEET

SPECIES Sandhill Crane *Grus canadensis*

Subspecies Florida Sandhill Crane *G. c. pratensis*

CITES
APPENDIX II

USFWS
Threatened

IUCN
no special status

Mace/Lande (Species)
Secure

Subspecies
Secure

Distribution
Florida and S Georgia.

Population Size (Est.)
8,000+

 # Populations
2 - Florida
Okeefenokee: 200-400

Area - sq K

Population Trend
Increasing.

Threats
Wetlands loss in Florida.

Trade Data

Comments
Include a PVA for Okeefenokee flock during Mississippi PVA.

Field Studies (Done, In progress - Who?)
Nesbitt et al., many studies; Walkinshaw studied nesting success; Layne, breeding, sibling aggression; Bishop, density, breeding, habitat quality; Bennett, same, but in Georgia.

PVA
No; (Yes for Okeefenokee)

Wild Management
No, (unless PVA suggests extra management for Okeefenokee).

Research Needed (Surv, Tax, Husb)
Taxonomic distinction from other subspecies

Captive Population(s)
298 in ISIS; 285 in N. America; 13 in Europe
good founder representation.
81 (Okeefenokee)

Captive Program
Nuc (II) - Florida
Nuc (I) - taxon dependent

TAXON DATA SHEET

SPECIES Sandhill Crane *Grus canadensis*

Subspecies Cuban Sandhill Crane *G. c. nesiotes*

CITES
Endangered

USFWS
Endangered

IUCN
Endangered

Mace/Lande (Species)
Secure

Subspecies
Critical

Distribution
Cuba, including the Isle of Pines.

Population Size (Est.)
< 100

 # Populations
2

Area - sq K
< 50,000 on an island

Population Trend
Declining

Threats

Trade Data

Comments
Cuba has interacted with CBSG and expressed interest in involvement with conservation programs.

Field Studies (Done, In progress - Who?)
Walkinshaw studied this ssp. on the Isle of Pines. Faanes is cooperating with Cuban ornithologists to study the Cuban Sandhill.

PVA
Yes

Wild Management
Yes

Research Needed (Surv, Tax, Husb)
Survey work needed

Captive Population(s)
0

Captive Program
90/100 (I)

Participants' First Draft

TAXON DATA SHEET

SPECIES Sarus Crane *Grus antigone*

Subspecies Indian Sarus Crane *G. a. antigone*

CITES	USFWS	IUCN
		no special status

Mace/Lande (Species)
Secure

Subspecies
Vulnerable; may increase to Endangered due to human population growth

Distribution
India, S Nepal, possibly E Pakistan.

Population Size (Est.)	# Populations	Area - sq K
25,000 999,000	2+	500-

Population Trend
Decreasing due to huge constriction of range. Remaining flocks are in Hindu areas; destroyed in Muslim areas.

Threats
Wetland loss due to increasing human need for land in India. Problems with pesticide at Bharatpur.

Trade Data
Significant numbers of birds have been reported; impact on local populations of birds needs to be investigated.

Comments

Field Studies (Done, In progress - Who?)
Prakash Gole has initiated a major study of the Sarus, part of which is completed (Phase I). Very little substantive work has been done.

PVA
Yes

Wild Management
Yes

Research Needed (Surv, Tax, Husb)
Population trend data and habitat needs in India, perhaps to identify a few key places for protection. Taxonomic research would be helpful.

Captive Population(s)
130; exported for many years.
138 in ISIS - 82 NA, 15 NA, 3 Israel;
large numbers in private collections.
50-100 in Europe.

Captive Program
NUC II

TAXON DATA SHEET

SPECIES Sarus Crane *Grus antigone*

Subspecies Eastern Sarus Crane *G. a. sharpii* - SE Asia
G. a. gilli - Australia

CITES **USFWS** **IUCN**

Mace/Lande (Species)
Secure

Subspecies
Secure in Australia
Vulnerable in SE Asia

Distribution
NE Australia, SE Asia

Population Size (Est.)
1-2,000 SE Asia
Unknown in Australia

 # Populations
Burma
Indochina (Laos, Cambodia, Vietnam)

Area - sq K
B

Population Trend
Increasing in Australia, unknown in SE Asia. Disappeared from Yunnan (China), Thailand, and probably Phillipines (possibly distinct subspecies).

Threats
Hunting and habitat loss in SE Asia. Human population pressure increases with time in SE Asia. Vietnam war wrecked huge amounts of habitat; some has been rehabilitated. Extremely vulnerable to loss of habitat since Vietnam war.

Trade Data
Some trade appears to occur between Cambodia and Thailand.

Comments
Two breeding areas in S. Laos. Australian species hybridizes with Brolgas.

Field Studies (Done, In progress - Who?)
Archibald and Swengel. 1987. Comparative ecology and behavior of Eastern Sarus Cranes and Brolgas in Australia. pp. 107-116 in *Proc. 1985 Crane Workshop*. Studies by Archibald and Barzen in Vietnam in progress (see The ICF Bugle).

PVA
Yes.

Wild Management
Tram Chim Nature Reserve, Vietnam. Monitor hybrid zone in Australia.

Research Needed (Surv, Tax, Husb)
Where do SE Asia Sarus breed? Can Vietnam habitat be improved to promote breeding?

Captive Population(s)
35+ birds in Thailand, mostly SE Asian stock.

Captive Program
Bred at ICF and one in Thailand. ICF has 10 birds from Australia. Walsrode, Miami, and Fort Worth have a few birds.

TAXON DATA SHEET

SPECIES Brolga Crane *Grus rubicunda*

Subspecies Two subspecies were proposed at one time, but they are not recognized by many Crane biologists.

CITES	**USFWS**	**IUCN**
APPENDIX I	no special status	no special status

Mace/Lande (Species)	**Subspecies**
Secure	No special status

Distribution
Most of N Australia except desert regions, and locally in SE part of Australia; southern New Guinea.

Population Size (Est.)	**# Populations**	**Area - sq K**
20-25,000	1	E

Population Trend
Decreasing in S Australia. Trend elsewhere not reported in literature. Archibald believes stable.

Threats
Competition with Eastern Sarus in north, which is now showing evidence of expanding westward to areas formerly occupied only by Brolgas. Coastal wetlands where Cranes spend dry season in Queensland are being inundated by brushy vegetation as a consequence of erosion of upland areas. Loss of wetlands in south reduces breeding habitat.

Trade Data
Almost no trade, since Australia strictly limits exports of Brolgas.

Comments
Closely related to White-naped and Sarus. Cause crop damage, but protected, cannot be shot.

Field Studies (Done, In progress - Who?)
J.G. Blackman did graduate work on Brolgas and has published the most on the species; he estimated the population in one part of its range. Archibald studied Brolgas in the 1970s. Archibald and Swengel published on the nesting ecology (1985 Crane Workshop). Bravery has also studied them. White studies Brolgas in S Australia. Haffenden studies them in Queensland.

PVA	**Wild Management**
No	No

Research Needed (Surv, Tax, Husb)
Population trend. Is Eastern Sarus displacing the Brolga?

Captive Population(s)
10.6.6 reported to ISIS.
Australian zoos unknown.
3.1 at ICF
2.0 at Walsrode
1 at Berlin, 1 at Whipsnade, 1 in Thailand.

Captive Program
Taronga and ICF have bred them.
Possibly other Australia zoos breed Brolgas.
Nuc II in Australia

Participants' First Draft

TAXON DATA SHEET

SPECIES White-naped Crane *Grus vipio*

Subspecies

CITES
APPENDIX I

USFWS
Endangered

IUCN
Endangered

Mace/Lande (Species)
Endangered

Subspecies
None

Distribution
SE Russia, E Mongolia, and N China in summer. S Kyushu (Japan); SE China, mainly Poyang Lake (several thousand) and Dongting (50); and Korea (DMZ) in winter (several hundred).

Population Size (Est.)
4446 in winter 1990-91
(see The ICF Bugle, 17-4)
approx. 5000 per G. Archibald

 # Populations

Area - sq K

Population Trend
Stable or increasing. Only 40-50 birds in Japan in early 1950s, steadily increasing due to protection and winter feeding.

Threats
Breeding wetlands and grasslands being converted to agriculture very rapidly in main Sino-Soviet border breeding areas and in other areas of N China. Minuscule wintering area in Japan. Threat to Poyang Lake wintering area if Three Gorges Dam is built, could lose 50%. High concentration on winter feeding area-disease. Problem with pesticides in Amur region.

Trade Data

Comments
Closely related to Sarus and Brolga. Satellite radio placed on a bird last year should provide useful information on migration route. In January 1994 there will be a meeting on birds and wetlands of the Yangtze Valley.

Field Studies (Done, In progress - Who?)
The best published work is in Proceedings 1987 International Crane Workshop, J. Harris, editor. Little substantive research on the breeding grounds had been published before this. Russians are studying White-napeds in the Amur River region. Several papers on wintering and migrating have been published by Japanese researchers, e.g. Ozaki.

PVA

Wild Management

Research Needed (Surv, Tax, Husb)

Captive Population(s)
see Chris Sheppard's int'l genealogy.
ISIS: 67.67.11 (145) 15% wild born.
Studbook: 44.35.7 (86) in USA.
>100 in China; 25 in Russia.
founder repr 25 birds; reproduction targeted a low rate -- breeds well; need additional institutions to hold non-breeding specimens.

Captive Program
SSP, EEP, SSCJ

TAXON DATA SHEET

SPECIES Eurasian Crane *Grus grus*

Subspecies *G. g. grus* and *G. g. lilfordi*; very questionable--the two intergrade and may not be valid subspecies; originally based on color differences caused by feather painting.

CITES	**USFWS**	**IUCN**
APPENDIX II		no special status

Mace/Lande (Species)
Secure

Subspecies
Both are secure.

Distribution
N Eurasia in summer. S Asia and NE Africa in winter. Breeds as far south as Turkey in central part of its range.

Population Size (Est.)	**# Populations**	**Area - sq K**
> 100,000	western expanding to breed in England & winter in France; also found in Turkey, Tibetan Plateau & Eurasia	>1,000,000

Population Trend
Extremely stable.

Threats
Agricultural development of its E Europe and Asian breeding grounds, crowded quarters on wintering grounds in some places. Large numbers winter in vulnerable S Asian and NE African sites where population pressure is great. Hunted in S Asia. Problem with pesticides in Sudan.

Trade Data

Comments
Problem with crop damage in Spain. Shot and captured by the 100s in Hindu Kush. Range sparse in E. Siberia.

Field Studies (Done, In progress - Who?)
Swanberg and others in Sweden; Prange's 1987 ICW paper is excellent; Prange on resting places; B. Behlau on migration; Bylin on breeding; Alerstam has studied migration strategies; the Alonso and Fernandez-Cruz on winter activities; and many more.

PVA
Yes; crops in Spain, hunting in Pakistan; Rugen Island 1994.

Wild Management
Yes.

Research Needed (Surv, Tax, Husb)
Subspecies determination: Tibetan Plateau - isolated, different habitat; also Turkey. Keep monitoring for trends, esp. habitat.

Captive Population(s)
29.18.24
27 US
16 Europe
8 Canada
about 40 in China
120 in Russia

Captive Program
None now.

TAXON DATA SHEET

SPECIES Hooded Crane *Grus monachus*

Subspecies

CITES	USFWS	IUCN	LOCAL PROTECTION
APPENDIX I	Endangered	Endangered/Rare	China: First Class

Mace/Lande (Species)
Vulnerable

Subspecies
None

Distribution
Breeds just N of White-naped and Red-crowned Cranes in temperate to N Asia, E of central Mongolia, also Yakutia, Russia. Winters principally in S Kyushu and S Honshu, Japan; secondary sites in SE China and Korea.

Population Size (Est.)
10442 in winter 1990-91; does not include Korea. (<u>The ICF Bugle</u>, 17-4)

 # Populations
1 breeding
3 wintering
Izumi - 10,000
other areas of Japan - 150

Area - sq K
Breeding C
Wintering A

Population Trend
Increasing in Japan, decreasing in China.

Threats
D,L. Loss of breeding habitat due to wetlands drainage in Russia. Honshu wintering ground overcrowded. Risk of disease at feeding stations in Japan. Poisoning occurs at Poyang Lake and likely other areas. Hooded Cranes feed on poisoned grain used to catch waterfowl. Wintering area at Tegu is threatened by road construction.

Trade Data

Comments
Perhaps safer than other rare E Asian Cranes because: 1) They breed principally in wooded marshes which are less desirable for agriculture than open marshes; and 2) their primary wintering ground is not in China near the Yangtze River which may be changed by the Three Gorges Dam. Japan's human population is stable, unlike China's. Feed on wintering ground in Japan near Izumi. Nests are very difficult to find because they are dark and blend in, and the Cranes are quiet.

Field Studies (Done, In progress - Who?)
Russians have studied the breeding, esp. Vorbiev, Pukinskii and Ilyinskii. Wintering has been studied intensively in Japan by Ohsako and others, including social behavior. Archibald described displays. Diet and population studied by Won and others in Korea. Migration studied by international project of Japan, Russia and China.

PVA

Wild Management

Research Needed (Surv, Tax, Husb)

Captive Population(s)
34.42.6 (82) in international studbook.
2.5.6 (13) birds in Japanese registry.
43 in N. America (8 founders); 20 in China, 20 in Russia. See Bohmke's studbook and report attached.

Captive Program
SSP, SSCJ

TAXON DATA SHEET

SPECIES Whooping Crane *Grus americana*

Subspecies

CITES	USFWS	IUCN
APPENDIX I	Endangered	Endangered

Mace/Lande (Species)
Critical

Subspecies

Distribution
Breeds in Wood Buffalo National Park, N.W.T. and adjacent Alberta, Canada. Migrates in narrow band between Canada and Aransas National Wildlife Refuge in Texas, USA. Experimental, non-breeding flock summers near Grays Lake, Idaho and migrates through Monte Vista NWR, winters in New Mexico.

Population Size (Est.)	# Populations	Area - sq K
162 in summer 1992 (150 Wood Buffalo, 12 Gray's Lake)	1 breeding flock - WBNP/Aransas 1 non-breeding flock - Grays Lake	< 50,000

Population Trend
Increased 9-fold since 1941 in main flock. Bottleneck of 14 birds in 1941.

Threats
Catastrophe on wintering ground (esp. disease risk) and, to a lesser extent on breeding ground. Chemical transport through Aransas NWR and tropical storms are potential disasters. Drought at Aransas appears harmful when that occurs. A sustained drought on breeding ground (as distinguished from normal drought cycle) would be a major blow to the population.

Trade Data

Comments
Most intensively managed species in wild, longest history of recovery efforts.

Field Studies (Done, In progress - Who?)
See Whooping Crane Recovery Plan (USFWS 1986), Canadian Whooping Crane Recovery Plan (Environment Canada) and 1991 PVA book. 1992: 40 nests, 30 chicks, 4 twins.

PVA
Held in August 1991.

Wild Management
Continue intensive management at Wood Buffalo National Park.

Research Needed (Surv, Tax, Husb)
Is winter habitat limiting at Aransas, or can Cranes pack in tighter if population increases? How to release birds and establish a new flock that breeds.

Captive Population(s)
ICF: 15.15.13 (43)
Patuxent: 17.17.9 (53)
San Antonio: (2)
will soon have 2 pair.

Captive Program
90% of captive-bred Whoopers were produced at Patuxent 1975 to present. ICF also has Calgary significant breeding program.
Transfer valuable bloodlines into captivity at the Calgary Zoo's Research Center.

TAXON DATA SHEET

SPECIES Black-necked Crane *Grus nigricollis*

Subspecies

CITES	**USFWS**	**IUCN**
APPENDIX I	Endangered	Endangered

Mace/Lande (Species)
Endangered

Subspecies

Distribution
Tibet, Qinghai, and parts of neighboring Chinese provinces, and Ladakh (India) in summer. Tibet, Guizhou, Yunnan, part of Qinghai, Bhutan, Ladakh, and N. Vietnam (?) in winter.

Population Size (Est.)	**# Populations**	**Area - sq K**
4025 in winter 1990-91 (The ICF Bugle, 17-4) >5000, not all areas surveyed	possibly 4	

Population Trend
Stable in Bhutan, Guizhou & Yunnan. Stable or increasing in Tibet; M.A. Bishop saw little negative impact.

Threats
Agricultural development of marshes on both summer and winter ranges, since bird is highly aquatic. Greatest threat is possible mass changeover from barley farming to wheat farming in Tibet; Cranes don't use wheat field, but use barley extensively.

Trade Data
Almost no trade internationally since China strictly controls its Black-neckeds.

Comments
Population may be larger than 5000; not all of Tibet and other wintering areas have been surveyed. Treasured and protected in Tibet.

Field Studies (Done, In progress - Who?)
Liao Yanfa, breeding biology and captive breeding; Li Dehao, breeding and wintering ecology; Li Fengshan, excellent data on breeding ecology and on wintering behavior (time budgets); M.A. Bishop, winter population and distribution; many others by Chinese authors. Reserves in Yunnan & Guizhou.

PVA
Yes

Wild Management
Local education.

Research Needed (Surv, Tax, Husb)
Monitor population along a set route in Tibet using part or all of current route of Bishop, et al. Study taxonomy of subpopulations. Continue surveys. Husbandry research.

Captive Population(s)
Studbook lists 86 living, 91 records, does not include 1992 chicks.
1.2 reported to ISIS

Captive Program
Beijing, ICF, Walsrode, and Xining breed this species. Chinese studbook has been started by Zhao Quingguo of the CAZG. Most nesting occurs in late June in captivity, regardless of location.

TAXON DATA SHEET

SPECIES Red-crowned Crane *Grus japonensis*

Subspecies
Archibald has proposed mainland race *G. j. panmunjonensis* based on Unison Call differences between it and Japanese *G. j. japonensis*. (Mainland birds are larger?)

CITES	USFWS	IUCN
APPENDIX I	Endangered	Endangered

Mace/Lande (Species)
Endangered

Subspecies
3 on mainland (separated by mtn ranges): Zhalong, Mongolian grasslands, Amur/Ussuri Region.

Distribution
E Asia, 40°-50° N, esp. Sino-Soviet border E of Mongolia in summer. Winters coastal Jiangsu (40-50% of total), other coastal places in China as far N as Liaoning (10%), non-mig. flock on Hokkaido, Japan (30-35%). Up to 300 winter on Korean Peninsula.

Population Size (Est.)
1120 in winter 1990-91
(ICF Bugle, 17-4)
about 1600-1700

 # Populations
4? breeding populations: Japan & perhaps 3 mainland populations.
Winter: Hokkaido = 502 nonmigratory, plus a few on Kuril Islands; N & S Korea DMZ = 300; Jiangsu, China = 700-800

Area - sq K

Population Trend
Stable according to 1979 & 1984 spring surveys in NE China; increasing slowly in Japan. Could be decreasing in China by now, but no proof.

Threats
Rapid habitat loss in Sino-Soviet stronghold due to Russian privatization & Chinese increases in agriculture. Chinese wintering ground on coastal salt marshes is vulnerable to development or alteration by proposed Three Gorges Dam. Japan resident population is losing habitat; pairs are being forced into small nesting sites. At least 16 Red-crowneds poisoned at Yancheng (ducks were the target). Local people burn wetlands at Khinganski & Lake Khanka which destroys nests; trying to stop this.

Trade Data
Generally well regulated. Limited collection of eggs and young.

Comments
In captivity, the breeding success is reduced about 65% per unit egg laid when pairs are interbreeding. Second rarest. Treasured in Japan.

Field Studies (Done, In progress - Who?)
See PVA form for references. Sergei Vinter has found nests not >5 km from humans. Khinganski Nature Reserve. Andronov: captive rearing & release, near human settlement, bring in captive birds. Release occurring in Kushiro, Japan, at Zhalong Nature Reserve in Heilongjiang, China, and Khinganski Nature Reserve, Russia.

PVA
Conducted at the Crane Conservation Workshop in Calgary, August 1992. Research on subspecies.

Wild Management
Protect breeding areas: regulate agricultural development; ecological education in Russia about grass burning; stop dam construction; spread out feeding areas in Japan; control fire.

Research Needed (Surv, Tax, Husb)
Pop. trend on mainland -- best done in Jiangsu (i.e., continue coordinated winter survey already established by China, Japan, & the 2 Koreas). Is habitat loss in NE China causing reduction in breeding population, or just making territories smaller?

Captive Population(s)
500+ described in 20 year old studbook

Captive Program
Large, growing captive pop. Mgmt

now kept by Teruyuki Komiya of the Ueno Zoo with unregistered birds in China, est. 650.

programs underway for N. America, Europe & Japan, & under dev. in China. Liu Dajun has agreed to do Chinese studbook. GASP initiated in Calgary in August 92. Follow-up planned for '93 in China or Japan.

CRANE
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Participants' First Draft Report

from a Collaborative Workshop
held 9-15 August 1992
Calgary, Alberta, Canada

SECTION 3

ISIS ABSTRACT DATA

Turnix melanogaster/**BLACK-BREASTED QUAIL/**

PITTS CA	1.	1.	0(0)	SANDIEGOZ	0.	2.	3(0)	ADELAIDE	2.	3.	0(1)	CURRUMBIN	0.	0.	1(0)	PERTH	6.	2.	1(0)	SYDNEY	4.	4.	0(0)

Total held: 13.12.5 Number of institutions: 6 Captive Born: 80% Wild Born: 0% Captive births last 12 months: 1 Deaths first 30 days: 0

Turnix pyrrhothorax/**RED-CHESTED QUAIL/**

WINNELLIE	1.	4.	0(0)

Total held: 1.4.0 Number of institutions: 1 Captive Born: 40% Wild Born: 20% Captive births last 12 months: 0 Deaths first 30 days: 0

Turnix suscitator/**BARRED QUAIL/**

FRANKFURT	3.	3.	2(11)

Total held: 3.3.2 Number of institutions: 1 Captive Born: 63% Wild Born: 0% Captive births last 12 months: 11 Deaths first 30 days: 0

Turnix sylvatica/**LITTLE BUTTON QUAIL/**

PRETORIA	0.	0.	2(0)	CINCINNAT	1.	0.	0(0)

Total held: 1.0.2 Number of institutions: 2 Captive Born: 33% Wild Born: 33% Captive births last 12 months: 0 Deaths first 30 days: 0

Turnix varia/**PAINTED QUAIL/**

CLEVELAND	0.	0.	1(0)	HEALESVIL	0.	1.	1(0)	SYDNEY	0.	1.	0(0)

Total held: 0.2.2 Number of institutions: 3 Captive Born: 25% Wild Born: 75% Captive births last 12 months: 0 Deaths first 30 days: 0

Turnix maculosa/**RED-BACKED BUTTON QUAIL/**

WINNELLIE	1.	0.	0(0)

Total held: 1.0.0 Number of institutions: 1 Captive Born: 0% Wild Born:100% Captive births last 12 months: 0 Deaths first 30 days: 0

Family Totals: 24.21.11 Captive Born: 68% Wild Born: 11% Captive births last 12 months: 12 Deaths first 30 days (of captive birth): 0

Family - *Pedionomidae*/**COLLARED HEMIPODES/**

Pedionomus torquatus/**COLLARED HEMIPODE/**

ADELAIDE	1.	1.	0(0)

Total held: 1.1.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Family Totals: 1.1.0 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days (of captive birth): 0

Family - *Gruidae*/**CRANES/**

Anthropoides paradisea/**STANLEY CRANE/**

METROZOO	0.	0.	0(2)	AMSTERDAM	0.	1.	0(0)	ARNHEM	1.	1.	0(0)	AUGSBURG	1.	0.	0(0)	CLERES	0.	1.	0(0)	HAYLE	4.	2.	0(0)
KOLN	0.	1.	0(0)	KREFELD	1.	1.	0(0)	LODZ	2.	2.	0(0)	MARWELL	2.	1.	0(0)	MULHOUSE	1.	1.	2(0)	PARIS ZOO	2.	1.	1(1)
ROTTERDAM	3.	3.	0(2)	SAARBRUCK	1.	1.	1(0)	TOUROPARC	1.	1.	0(0)	WHIPSNADE	2.	2.	0(1)	PRETORIA	2.	1.	1(0)	BALTIMORE	1.	1.	0(1)
BARABOO	1.	1.	0(0)	BROWNSVIL	1.	0.	0(0)	CLEVELAND	0.	1.	0(0)	DENVER	1.	0.	1(0)	DETROIT	1.	1.	0(0)	DICKERSON	1.	1.	0(0)
DOSWELL	0.	1.	0(0)	EVANSVLLE	1.	1.	0(0)	FRANKLINP	1.	1.	0(0)	GULF BREZ	1.	0.	0(0)	HONOLULU	2.	0.	0(0)	HOUSTON	1.	1.	0(0)
NELSONS	1.	1.	0(0)	NZP-WASH	1.	0.	0(0)	OKLAHOMA	0.	2.	0(0)	OMAHA	1.	2.	1(0)	RIO GRAND	1.	1.	0(0)	SAN ANTON	1.	1.	0(0)
SANDIEGOZ	2.	2.	0(0)	SD-WAP	1.	2.	0(0)	SEDGWICK	0.	1.	0(0)	ST LOUIS	1.	1.	0(0)	STCATHERN	1.	2.	0(0)	TOLEDO	1.	1.	1(1)
TRACY AV	1.	1.	0(0)	WILD WRLD	2.	2.	1(4)	YULEE	2.	2.	2(2)	MOSCOW	1.	0.	0(0)	TAIPEI	1.	1.	0(0)				

Total held: 53.51.11 Number of institutions: 47 Captive Born: 70% Wild Born: 5% Captive births last 12 months: 14 Deaths first 30 days: 3

Anthropoides virgo/DEMOISELLE CRANE/

AMERSFOOR 0. 3. 0(0)	AMSTERDAM 2. 1. 0(0)	ANTWERP 1. 1. 0(0)	ARNHEM 1. 1. 1(1)	AUGSBURG 0. 1. 2(0)	BARCELONA 1. 2. 0(0)
BRISTOL 2. 2. 0(0)	CHESTER 1. 1. 0(0)	CLERES 5. 6. 2(1)	COLCHESTR 1. 1. 0(0)	DE CAMPO 0. 0. 1(0)	HAMBURG 2. 4. 0(0)
HAYLE 1. 1. 0(0)	HILVARENB 0. 1. 0(0)	KARLSRUHE 0. 2. 8(0)	KOLN 0. 0. 2(0)	KREFELD 4. 3. 0(0)	LA PALMYR 0. 0. 1(0)
LONDON RP 1. 1. 1(2)	MUNSTER 3. 2. 3(0)	PARIS JP 1. 2. 0(0)	PENSCYNOR 1. 1. 0(0)	ROTTERDAM 1. 2. 0(0)	ASHEBORO 1. 1. 0(0)
ATLANTA 1. 1. 0(1)	AUDUBON 1. 1. 0(0)	BALTIMORE 1. 2. 0(1)	BARABOO 2. 1. 0(1)	BIRMINGHM 1. 1. 0(0)	BROWNSVIL 1. 1. 0(0)
CALGARY 1. 1. 0(0)	CLEVELAND 1. 2. 0(0)	COLUMBUS 1. 1. 0(0)	DALLAS 1. 1. 0(0)	DENVER 0. 2. 2(0)	DETROIT 1. 2. 0(0)
EVANSVLLE 0. 1. 0(0)	FORTWORTH 2. 2. 0(3)	FRESNO 0. 1. 1(0)	GARDENCTY 1. 1. 0(0)	JACKSONVL 1. 1. 0(0)	LAKEBUENA 1. 3. 1(1)
LOUISVILL 3. 2. 0(0)	LOWRY 1. 1. 0(1)	MADISON 1. 1. 0(0)	MANHATTAN 1. 1. 0(0)	MEMPHIS 1. 1. 0(0)	METROZOO 1. 1. 0(0)
MINNESOTA 2. 1. 0(0)	MONTGOMRY 2. 0. 0(0)	NY BRONX 1. 1. 0(0)	NZP-WASH 1. 1. 0(0)	OKLAHOMA 1. 1. 0(0)	OMAHA 3. 3. 0(0)
PITTS CA 1. 0. 0(1)	PITTSBURG 1. 0. 0(0)	REDWOOD 0. 1. 0(0)	ROCKTON 1. 1. 0(0)	SAN ANTON 2. 1. 1(2)	SAN FRAN 2. 0. 0(0)
SANDIEGOZ 0. 1. 0(0)	SD-WAP 1. 1. 0(0)	SEATTLE 1. 1. 0(0)	SEDGWICK 1. 1. 0(0)	ST FELICI 0. 0. 1(0)	ST LOUIS 0. 1. 0(0)
ST PAUL 1. 2. 0(0)	TAUTPHAUS 1. 1. 0(0)	TOPEKA 1. 1. 0(0)	TORONTO 2. 2. 0(0)	TRACY AV 1. 1. 0(0)	W ORANGE 1. 1. 2(0)
WILD WRLD 1. 1. 0(0)	WINSTON 1. 0. 0(0)	KINGSTON 0. 0. 1(0)	TALLIN 7. 3. 0(0)	TOKYOUENO 1. 1. 0(0)	

Total held: 91.99.30 Number of institutions: 77 Captive Born: 47% Wild Born: 10% Captive births last 12 months: 15 Deaths first 30 days: 4

Bugeranus carunculatus/WATTLED CRANE/

CHESTER 1. 1. 0(0)	CLERES 1. 0. 0(0)	FRANKFURT 1. 1. 0(1)	HAYLE 4. 3. 0(0)	KREFELD 2. 2. 0(0)	PAIGNTON 2. 1. 0(0)
WHIPSNADE 2. 2. 0(0)	PRETORIA 1. 0. 0(0)	ASHEBORO 1. 2. 0(0)	BALTIMORE 3. 6. 0(1)	BARABOO 3. 2. 0(0)	BROWNSVIL 3. 4. 0(0)
CINCINNAT 1. 2. 0(0)	DALLAS 1. 1. 0(0)	DENVER 1. 1. 0(0)	FORTWORTH 0. 1. 0(0)	GULF BREZ 1. 1. 0(0)	LOUISVILL 1. 1. 0(0)
METROZOO 0. 0. 1(1)	NZP-WASH 1. 1. 0(0)	OKLAHOMA 2. 2. 0(0)	SAN ANTON 1. 1. 0(0)	SANDIEGOZ 0. 1. 0(0)	SD-WAP 1. 1. 0(0)
STCATHERN 8. 7. 2(0)	YULEE 2. 1. 0(0)	TAIPEI 1. 0. 0(0)	TOKYOUENO 1. 3. 0(3)		

Total held: 46.48.3 Number of institutions: 28 Captive Born: 52% Wild Born: 36% Captive births last 12 months: 6 Deaths first 30 days: 0

Grus americana/WHOOPING CRANE/IUCN Red List: Endangered in wild

BARABOO 19. 18. 0(16)	CALGARY 2. 2. 0(0)	NZP-WASH 0. 0. 1(0)	PATUXENT 12. 16. 0(1)	SAN ANTON 2. 2. 0(0)

Total held: 35.38.1 Number of institutions: 5 Captive Born: 93% Wild Born: 5% Captive births last 12 months: 17 Deaths first 30 days: 4

Grus antigone (no subsp)/SARUS CRANE/

AMERSFOOR 2. 1. 0(0)	BARCELONA 1. 1. 0(0)	BELFAST 0. 1. 0(0)	COLWYNBAY 1. 1. 0(0)	DE CAMPO 1. 0. 0(0)	GIVSKUD 1. 0. 0(0)
HAMBURG 1. 1. 0(0)	HAYLE 2. 2. 0(0)	HEIDELBRG 1. 1. 1(1)	HELSINKI 1. 1. 0(0)	HILVARENB 0. 1. 0(0)	KARLSRUHE 1. 0. 5(0)
LA PALMYR 0. 0. 3(0)	MARWELL 2. 2. 1(2)	MUNICH 1. 1. 0(0)	PAIGNTON 1. 0. 1(1)	SAARBRUCK 0. 1. 1(0)	WHIPSNADE 0. 1. 0(0)
ATLANTA 0. 1. 0(0)	BATONROUG 1. 1. 0(0)	BOWMANVIL 1. 1. 0(0)	CALGARY 1. 1. 0(0)	CINCINNAT 1. 0. 0(0)	CLEVELAND 1. 1. 0(0)
COLUMBUS 1. 1. 0(0)	EVANSVLLE 1. 1. 0(4)	KNOWLAND 1. 0. 0(0)	KNOXVILLE 1. 1. 0(0)	LOSANGELE 0. 1. 0(0)	LOUISVILL 0. 2. 1(1)
LOWRY 1. 1. 0(0)	MINNESOTA 0. 0. 2(0)	NZP-WASH 1. 1. 0(0)	OKLAHOMA 0. 1. 0(0)	OMAHA 2. 2. 0(1)	PROVIDNCE 0. 2. 0(0)
RIO GRAND 1. 2. 0(0)	SCOTTSBLU 1. 1. 0(0)	SOUTHBEND 1. 0. 0(0)	ST LOUIS 1. 0. 0(0)	TOPEKA 0. 1. 0(0)	W PALM BE 1. 1. 0(0)
WINSTON 1. 1. 0(0)	YULEE 1. 1. 0(0)	GUADALJR 1. 1. 0(0)	RAMAT GAN 1. 1. 0(0)	TAIPEI 2. 1. 0(1)	

Total held: 40.43.15 Number of institutions: 47 Captive Born: 54% Wild Born: 6% Captive births last 12 months: 11 Deaths first 30 days: 3

Grus antigone antigone/INDIAN SARUS CRANE/

AUGSBURG 1. 1. 1(0)	BURFORD 1. 1. 0(0)	CLERES 2. 2. 0(1)	PARIS ZOO 1. 1. 0(0)	TOUROPARC 1. 0. 0(0)	BALTIMORE 2. 2. 2(2)
BARABOO 1. 1. 0(0)	BROWNSVIL 1. 1. 0(0)	CAPE MAY 1. 1. 0(0)	FRANKLINP 1. 1. 0(0)	GULF BREZ 0. 1. 1(0)	METROZOO 0. 1. 0(0)
MONTGOMRY 0. 0. 2(0)	OKLAHOMA 2. 1. 0(0)	ROCHESTER 1. 1. 0(0)	SD-WAP 1. 1. 0(0)	TOPEKA 1. 0. 0(0)	WACO 1. 1. 1(0)

Total held: 18.17.7 Number of institutions: 18 Captive Born: 50% Wild Born: 21% Captive births last 12 months: 3 Deaths first 30 days: 0

Grus antigone sharpii/EASTERN SARUS CRANE/

BARABOO 4. 4. 0(0)	YULEE 1. 1. 0(0)

Total held: 5.5.0 Number of institutions: 2 Captive Born: 90% Wild Born: 10% Captive births last 12 months: 0 Deaths first 30 days: 0

Grus canadensis (no subsp)/SANDHILL CRANE/

ABILENE	2.	4.	0(0)	ALEXANDRI	0.	0.	1(0)	CALDWELL	2.	2.	0(0)	CALGARY	1.	0.	1(0)	LANSING	1.	1.	0(1)	LUFKIN	0.	0.	1(0)
MINNESOTA	0.	0.	1(0)	MONTGOMRY	1.	1.	0(0)	RIO GRAND	1.	0.	0(0)	SAN FRAN	0.	0.	2(0)	SEDGWICK	0.	1.	1(0)	SIOUX FAL	0.	0.	2(0)

Total held: 8.9.9 Number of institutions: 12 Captive Born: 65% Wild Born: 27% Captive births last 12 months: 1 Deaths first 30 days: 0

Grus canadensis (no subsp)/ <<< Hybrid >>> /SANDHILL CRANE/

BARABOO	0.	1.	0(0)	PATUXENT	1.	0.	0(0)

Total held: 1.1.0 Number of institutions: 2 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Grus canadensis canadensis/LESSER SANDHILL CRANE/

AKRON	0.	2.	0(0)	EMPORIA	1.	0.	0(0)	LOSANGELE	0.	0.	1(0)	NW TREK	0.	0.	1(0)	OMAHA	0.	1.	1(0)	RIO GRAND	0.	1.	0(0)
SCOTTSBLU	0.	0.	1(0)																				

Total held: 1.4.4 Number of institutions: 7 Captive Born: 11% Wild Born: 44% Captive births last 12 months: 0 Deaths first 30 days: 0

Grus canadensis pratensis/FLORIDA SANDHILL CRANE/

AUGSBURG	1.	0.	0(0)	WHIPSNADE	1.	1.	0(0)	AUDUBON	1.	1.	0(0)	BARABOO	5.	8.	5(4)	BATONROUG	1.	1.	0(0)	BINGHAMTO	0.	1.	0(0)
BRIDGEPRT	0.	1.	0(0)	CALGARY	2.	2.	0(0)	CAPE MAY	0.	0.	2(0)	COLUMBUS	1.	1.	0(0)	EL PASO	1.	1.	0(0)	EVANSVLLE	1.	1.	0(0)
GRANDISLE	1.	3.	0(0)	KANSASCTY	1.	1.	0(0)	KNOXVILLE	2.	1.	1(1)	LOWRY	0.	5.	0(0)	MANHATTAN	1.	1.	1(1)	NZP-CRC	6.	8.	0(2)
NZP-WASH	1.	0.	2(2)	OMAHA	2.	2.	0(0)	PATUXENT	32.	34.	45(63)	PHILADELP	1.	1.	0(0)	PROVIDNCE	1.	1.	0(0)	RACINE	0.	1.	0(0)
SALISBURY	1.	1.	1(1)	STCATHERN	6.	3.	6(0)	SYRACUSE	1.	0.	0(0)	WINSTON	0.	1.	0(0)								

Total held: 70.81.63 Number of institutions: 28 Captive Born: 94% Wild Born: 4% Captive births last 12 months: 74 Deaths first 30 days: 32

Grus canadensis pulla/MISSISSIPPI SANDHILL CRANE/IUCN Red List: Endangered in wild

NZP-CRC	2.	2.	0(0)	PATUXENT	20.	18.	42(55)

Total held: 22.20.42 Number of institutions: 2 Captive Born:100% Wild Born: 0% Captive births last 12 months: 55 Deaths first 30 days: 10

Grus canadensis rowani/CANADIAN SANDHILL CRANE/

PATUXENT	0.	0.	1(0)

Total held: 0.0.1 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Grus canadensis tabida/GREATER SANDHILL CRANE/

CLEVELAND	1.	1.	0(0)	EMPORIA	1.	2.	1(0)	FT WAYNE	0.	0.	1(0)	LOSANGELE	0.	0.	1(0)	LOUISVILL	1.	1.	1(1)	NW TREK	1.	2.	0(0)
OKLAHOMA	1.	1.	0(0)	PARAMUS	1.	1.	0(0)	PATUXENT	11.	13.	67(16)	RACINE	1.	0.	0(0)	RIO GRAND	1.	1.	0(0)	SCOTTSBLU	0.	1.	0(0)
TRACY AV	1.	1.	0(0)	W ORANGE	0.	0.	2(0)	WACO	1.	1.	2(0)	WILMINGTN	0.	2.	0(0)	WINSTON	0.	1.	0(0)	TOKYOUENO	1.	1.	0(0)

Total held: 22.29.75 Number of institutions: 18 Captive Born: 87% Wild Born: 9% Captive births last 12 months: 17 Deaths first 30 days: 3

Grus grus (no subsp)/COMMON CRANE/

AGRATE	1.	0.	3(0)	AMSTERDAM	1.	1.	0(0)	ARNHEM	1.	3.	0(0)	DUISBURG	0.	0.	1(0)	KARLSRUHE	0.	0.	5(0)	KREFELD	2.	1.	0(0)
PARIS JP	0.	0.	3(0)	SZEGED	1.	0.	0(0)	GLEN OAK	0.	0.	1(0)	MONTGOMRY	1.	0.	0(0)								

Total held: 7.5.13 Number of institutions: 10 Captive Born: 36% Wild Born: 20% Captive births last 12 months: 0 Deaths first 30 days: 0

Grus grus grus/COMMON CRANE/

AUGSBURG	2.	1.	0(0)	BARCELONA	0.	1.	0(0)	LA PALMYR	0.	1.	1(0)	MAGDEBURG	2.	2.	1(1)	NY BRONX	0.	0.	1(0)	TAIPEI	1.	0.	0(0)
TALLIN	2.	0.	0(0)																				

Total held: 7.5.3 Number of institutions: 7 Captive Born: 20% Wild Born: 47% Captive births last 12 months: 1 Deaths first 30 days: 0

Grus grus lilfordi/LILFORD'S CRANE/

BURFORD 1. 1. 0(0)	DE CAMPO 3. 4. 0(0)	MUNSTER 1. 0. 0(1)	BARABOO 1. 2. 1(0)	BIRMINGHM 1. 0. 0(0)	DENVER 1. 0. 0(0)
EVANSVLLE 2. 1. 1(0)	FRANKLINP 1. 0. 0(0)	KNOWLAND 0. 0. 1(0)	NY BRONX 2. 2. 0(0)	QUEBEC 1. 0. 0(0)	SAN FRAN 1. 1. 0(1)
SD-WAP 0. 1. 0(0)	TORONTO 1. 0. 0(0)				

Total held: 16.12.3 Number of institutions: 14 Captive Born: 16% Wild Born: 10% Captive births last 12 months: 2 Deaths first 30 days: 0

Grus japonensis/MANCHURIAN CRANE/IUCN Red List: Vulnerable in wild

AGRATE 1. 2. 0(0)	AMSTERDAM 1. 1. 0(0)	AUGSBURG 1. 1. 0(0)	BUDAPEST 2. 0. 0(0)	CHESTER 1. 3. 0(1)	DUISBURG 2. 0. 0(0)
FRANKFURT 1. 3. 0(2)	HAMBURG 2. 2. 0(0)	KOLN 1. 1. 0(0)	KREFELD 1. 1. 0(0)	LONDON RP 1. 1. 1(1)	MARWELL 1. 1. 0(0)
MUNICH 1. 1. 0(0)	MUNSTER 1. 1. 0(0)	ROTTERDAM 2. 1. 1(0)	WHIPSNADE 1. 1. 0(0)	AUDUBON 1. 1. 0(0)	BARABOO 3. 7. 2(1)
CINCINNAT 2. 1. 1(0)	DETROIT 0. 2. 0(0)	KANSASCTY 1. 1. 0(0)	KINGS ISL 1. 1. 0(0)	MANHATTAN 0. 1. 0(0)	NY BRONX 1. 1. 0(0)
NZP-CRC 3. 1. 1(0)	NZP-WASH 1. 1. 0(0)	PITTS CA 1. 1. 0(0)	SANDIEGOZ 1. 1. 0(0)	SD-WAP 2. 2. 0(0)	SEATTLE 1. 1. 0(0)
MOSCOW 2. 3. 2(1)	SINGAPORE 1. 1. 0(0)	TALLIN 1. 1. 0(0)	TOKYOUENO 2. 2. 0(0)		

Total held: 44.49.8 Number of institutions: 34 Captive Born: 82% Wild Born: 11% Captive births last 12 months: 6 Deaths first 30 days: 1

Grus leucogeranus/SIBERIAN WHITE CRANE/IUCN Red List: Endangered in wild

BARABOO 11. 10. 1(10)

Total held: 11.10.1 Number of institutions: 1 Captive Born: 95% Wild Born: 5% Captive births last 12 months: 10 Deaths first 30 days: 0

Grus monacha/HOODED CRANE/IUCN Red List: Vulnerable in wild

PLANCKNDL 0. 1. 0(0)	WHIPSNADE 1. 1. 0(0)	BALTIMORE 2. 3. 0(1)	BARABOO 2. 2. 0(0)	CINCINNAT 1. 1. 0(0)	CLEVELAND 1. 1. 0(0)
DENVER 1. 1. 0(0)	NY BRONX 5. 3. 0(0)	NZP-CRC 1. 1. 0(0)	OKLAHOMA 1. 2. 0(0)	PHILADELP 1. 1. 0(0)	SAN ANTON 1. 2. 1(2)
ST LOUIS 1. 0. 0(0)	MOSCOW 1. 3. 0(0)	TAIPEI 1. 0. 0(0)			

Total held: 20.22.1 Number of institutions: 15 Captive Born: 70% Wild Born: 26% Captive births last 12 months: 3 Deaths first 30 days: 1

Grus nigricollis/BLACK-NECKED CRANE/IUCN Red List: Indeterminate Status in wild

BARABOO 2. 3. 0(2)

Total held: 2.3.0 Number of institutions: 1 Captive Born: 60% Wild Born: 40% Captive births last 12 months: 2 Deaths first 30 days: 0

Grus rubicunda/AUSTRALIAN CRANE/

WHIPSNADE 1. 1. 1(1)	BARABOO 2. 1. 0(0)	ADELAIDE 1. 0. 0(0)	AUCKLAND 1. 1. 0(0)	HEALESVIL 1. 1. 0(0)	MELBOURNE 1. 1. 2(2)
PEARL CST 0. 0. 3(0)	PERTH 1. 1. 0(0)	SYDNEY 1. 0. 0(0)	WINNELLIE 1. 1. 2(0)		

Total held: 10.7.8 Number of institutions: 10 Captive Born: 64% Wild Born: 28% Captive births last 12 months: 3 Deaths first 30 days: 1

Grus vipio/WHITE-NAPED CRANE/IUCN Red List: Vulnerable in wild

AGRATE 0. 1. 0(0)	AUGSBURG 1. 1. 0(0)	BANHAM 1. 1. 0(0)	CHESTER 1. 1. 0(0)	DUISBURG 1. 2. 0(0)	FRANKFURT 1. 4. 0(4)
HAYLE 1. 0. 0(0)	JERSEY 3. 3. 0(0)	KREFELD 2. 2. 2(2)	LONDON RP 1. 0. 0(0)	MULHOUSE 1. 1. 0(0)	MUNSTER 2. 2. 1(0)
ROTTERDAM 1. 1. 0(2)	WHIPSNADE 2. 2. 1(1)	ZURICH 3. 2. 0(0)	PRETORIA 1. 1. 0(0)	BALTIMORE 1. 3. 0(0)	BARABOO 4. 3. 1(0)
BIRMINGHM 1. 0. 0(0)	BUFFALO 1. 1. 0(0)	CINCINNAT 2. 1. 0(0)	DENVER 1. 1. 0(0)	DETROIT 0. 1. 0(0)	MANHATTAN 1. 1. 0(0)
MEMPHIS 1. 1. 0(0)	NY BRONX 6. 6. 6(0)	NZP-CRC 3. 0. 0(0)	NZP-WASH 1. 1. 0(0)	OKLAHOMA 1. 1. 0(0)	OMAHA 1. 1. 0(0)
PITTS CA 1. 1. 0(0)	SAN ANTON 1. 1. 0(0)	SEATTLE 0. 1. 0(0)	SEDGWICK 1. 1. 1(0)	ST LOUIS 1. 1. 0(0)	STCATHERN 1. 2. 0(0)
MOSCOW 1. 1. 3(1)	TAIPEI 3. 2. 0(0)	TALLIN 1. 2. 0(0)	TOKYOUENO 2. 1. 0(1)		

Total held: 58.58.15 Number of institutions: 40 Captive Born: 79% Wild Born: 17% Captive births last 12 months: 11 Deaths first 30 days: 2

Balearica pavonina (no subsp)/AFRICAN CROWNED CRANE/

COLCHESTR 0. 1. 2(0)	KOLN 1. 1. 0(0)	MARWELL 0. 1. 0(0)	MUNSTER 0. 0. 8(0)	CAPE MAY 1. 1. 0(0)	GLEN OAK 0. 0. 2(0)
LITTLEROC 0. 1. 0(0)	MONROE 0. 0. 2(0)	MONTGOMRY 1. 1. 0(0)	PANAMACTY 1. 2. 0(0)	SAN FRAN 0. 0. 3(0)	WAIKOLOA 1. 3. 0(0)
TALLIN 0. 0. 2(0)					

Total held: 5.11.19 Number of institutions: 13 Captive Born: 20% Wild Born: 49% Captive births last 12 months: 0 Deaths first 30 days: 0

Balearica pavonina (no subsp)/ <<< Hybrid >>> /**AFRICAN CROWNED CRANE**/

FRANKLINP	1.	0.	0(0)

Total held: 1.0.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Balearica pavonina cecilae/**SUDAN CROWNED CRANE**/

CINCINNAT	0.	0.	2(0)	PITTSBURG	1.	1.	0(0)

Total held: 1.1.2 Number of institutions: 2 Captive Born: 0% Wild Born: 50% Captive births last 12 months: 0 Deaths first 30 days: 0

Balearica pavonina pavonina/**WEST AFRICAN CROWNED CRANE**/

AMSTERDAM	0.	3.	0(0)	ANTWERP	1.	0.	1(0)	ARNHEM	1.	1.	0(0)	AUGSBURG	0.	0.	8(0)	CHESTER	3.	5.	0(0)	CLERES	1.	0.	0(0)
HILVARENB	0.	2.	0(0)	KARLSRUHE	0.	0.	1(0)	KREFELD	0.	1.	0(0)	LA PALMYR	0.	0.	2(0)	LODZ	0.	1.	0(0)	SAARBRUCK	0.	0.	1(0)
TOUROPARC	1.	1.	0(0)	ALEXANDRI	0.	0.	3(0)	ASHEBORO	1.	2.	0(0)	AUDUBON	1.	1.	0(0)	BALTIMORE	1.	1.	0(0)	BARABOO	1.	1.	0(0)
BATONROUG	0.	1.	0(0)	BIRMINGHM	0.	1.	0(0)	BROWNSVIL	2.	2.	0(0)	DALLAS	0.	2.	0(0)	EVANSVLLE	0.	1.	0(0)	FORTWORTH	0.	2.	0(0)
LOSANGELE	1.	1.	2(0)	LOWRY	1.	1.	0(0)	LUFKIN	1.	2.	7(6)	MEMPHIS	2.	2.	0(0)	METROZOO	0.	1.	0(0)	OKLAHOMA	1.	2.	0(0)
OMAHA	0.	0.	2(0)	PHILADELP	1.	0.	1(3)	PROVIDNCE	1.	1.	0(1)	RACINE	1.	0.	1(0)	RIO GRAND	2.	1.	0(0)	SAN ANTON	1.	2.	0(0)
SANDIEGOZ	1.	1.	0(0)	SD-WAP	0.	0.	1(0)	ST PAUL	0.	1.	1(0)	STCATHERN	0.	1.	0(0)	TRACY AV	0.	1.	0(0)	YULEE	2.	4.	3(4)
ZOOLANIML	1.	1.	0(0)	RIYADH	2.	2.	0(0)	TAIPEI	0.	0.	1(0)												

Total held: 31.52.35 Number of institutions: 45 Captive Born: 36% Wild Born: 20% Captive births last 12 months: 14 Deaths first 30 days: 5

Balearica regulorum (no subsp)/**AFRICAN CROWNED CRANE**/

ANTWERP	0.	1.	0(0)	BARCELONA	1.	1.	0(0)	GIVSKUD	4.	3.	6(2)	HAYLE	2.	2.	0(0)	HEIDELBRG	0.	0.	5(0)	ODENSE	1.	1.	0(0)
PRETORIA	2.	2.	3(2)	CLEVELAND	3.	5.	0(0)	GRANBY	1.	1.	0(0)	KNOXVILLE	1.	1.	0(0)	ST FELICI	0.	0.	1(0)	TULSA	1.	1.	0(0)
TOKYOUENO	1.	1.	0(0)																				

Total held: 17.19.15 Number of institutions: 13 Captive Born: 20% Wild Born: 35% Captive births last 12 months: 4 Deaths first 30 days: 1

Balearica regulorum gibbericeps/**EAST AFRICAN CROWNED CRANE**/

ARNHEM	4.	1.	3(2)	BANHAM	4.	1.	2(0)	BRISTOL	1.	2.	0(0)	BURFORD	2.	1.	0(0)	FRANKFURT	3.	4.	1(3)	HILVARENB	3.	2.	0(0)
KARLSRUHE	0.	0.	13(0)	KREFELD	4.	5.	0(2)	LA PALMYR	0.	0.	5(0)	MAGDEBURG	2.	2.	2(0)	PARIS ZOO	3.	0.	3(0)	PENSCYNOR	1.	1.	0(0)
ROSTOCK	1.	1.	1(0)	ABILENE	0.	1.	0(0)	ATLANTA	0.	1.	0(0)	AUDUBON	2.	0.	2(2)	BALTIMORE	3.	4.	3(5)	BARABOO	0.	2.	0(0)
BATONROUG	2.	2.	2(2)	BROWNSVIL	4.	2.	0(2)	BUFFALO	1.	1.	0(0)	CALDWELL	3.	9.	0(4)	CINCINNAT	1.	2.	4(0)	COLUMBUS	2.	2.	0(0)
DENVER	2.	2.	2(5)	DES MOINE	2.	2.	0(0)	DETROIT	1.	1.	1(2)	DICKERSON	3.	1.	0(0)	DOSWELL	0.	0.	8(0)	EMPORIA	0.	1.	0(0)
EUREKA	1.	1.	0(0)	EVANSVLLE	1.	1.	0(0)	FORTWORTH	2.	3.	3(3)	FRESNO	1.	1.	0(0)	FT WAYNE	1.	1.	0(0)	GULF BREZ	5.	1.	0(0)
HONOLULU	1.	2.	1(1)	INDIANAPL	2.	1.	2(0)	JACKSONVL	1.	1.	0(3)	KINGS ISL	0.	0.	2(0)	KNOWLAND	0.	2.	0(0)	LAKEBUENA	1.	2.	3(1)
LITTLEROC	0.	1.	0(0)	LOUISVILL	5.	3.	0(0)	MADISON	2.	2.	0(0)	MEMPHIS	1.	1.	0(0)	METROZOO	4.	4.	0(0)	NELSONS	1.	1.	0(0)
NICHOLS	0.	1.	0(0)	NOBLE	1.	1.	0(0)	NORFOLK	1.	1.	0(0)	NY BRONX	1.	1.	0(0)	NZP-WASH	1.	2.	1(2)	OKLAHOMA	2.	2.	0(0)
OMAHA	3.	5.	0(0)	PHOENIX	0.	0.	2(2)	PITTS CA	1.	1.	0(0)	REDWOOD	0.	0.	2(0)	RIVERBANK	1.	1.	3(3)	S BARBARA	2.	1.	2(0)
SAN ANTON	6.	4.	0(0)	SCOTTSBLU	0.	0.	1(0)	SD-WAP	10.	11.	0(0)	SEATTLE	1.	1.	0(0)	SEDGWICK	2.	2.	0(0)	SOUTHBEND	1.	0.	0(0)
ST LOUIS	2.	2.	0(2)	TOPEKA	2.	1.	0(0)	TUCSON	2.	3.	1(0)	VANCOUVER	1.	1.	0(0)	W PALM BE	1.	1.	5(0)	WILD WRLD	1.	1.	0(1)
WINSTON	0.	1.	0(0)	YULEE	4.	6.	9(10)	SYDNEY	1.	1.	0(0)												

Total held: 130.132.89 Number of institutions: 75 Captive Born: 42% Wild Born: 26% Captive births last 12 months: 57 Deaths first 30 days: 11

Balearica regulorum regulorum/**SOUTH AFRICAN CROWNED CRANE**/

LODZ	0.	1.	0(0)	PAIGNTON	0.	1.	0(0)	WHIPSNADE	3.	1.	0(0)	HOGLE	1.	1.	0(0)	KNOWLAND	0.	0.	1(0)	TORONTO	3.	1.	0(0)

Total held: 7.5.1 Number of institutions: 6 Captive Born: 8% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Family Totals: 779.836.474 Captive Born: 62% Wild Born: 16% Captive births last 12 months: 326 Deaths first 30 days (of captive birth): 81

Family - *Psophiidae*/**TRUMPETERS**/

Psophia crepitans/**COMMON TRUMPETER**/

AMSTERDAM 0. 0. 1(0)	ARNHEM 2. 2. 0(0)	AUGSBURG 1. 1. 0(0)	BANHAM 1. 1. 0(0)	HAYLE 1. 1. 0(0)	HEIDELBRG 0. 0. 2(0)
ROTTERDAM 1. 1. 0(0)	BALTIM AQ 1. 0. 0(0)	BROWNSVIL 1. 1. 0(0)	CHICAGOBR 1. 1. 0(0)	EL PASO 1. 1. 0(0)	FORTWORTH 0. 1. 0(0)
FRESNO 0. 1. 0(0)	HONOLULU 1. 2. 4(12)	HOUSTON 1. 2. 0(0)	LAKEBUENA 0. 1. 0(0)	LOSANGELE 1. 1. 1(1)	MILWAUKEE 1. 2. 0(0)
NY BRONX 0. 1. 0(0)	NZP-WASH 0. 0. 2(0)	PHILADELP 0. 1. 0(0)	PHOENIX 1. 1. 0(0)	RIO GRAND 1. 1. 0(0)	SANDIEGOZ 0. 1. 2(0)
SD-WAP 5. 2. 4(3)	SEATTLE 3. 2. 0(1)	STATEN IS 0. 1. 0(0)	WILD WRLD 0. 1. 0(0)		

Total held: 24.30.16 Number of institutions: 28 Captive Born: 61% Wild Born: 16% Captive births last 12 months: 17 Deaths first 30 days: 1

Psophia leucoptera/WHITE-WINGED TRUMPETER/

HEIDELBRG 1. 1. 1(0)	OMAHA 0. 1. 0(0)

Total held: 1.2.1 Number of institutions: 2 Captive Born: 75% Wild Born: 25% Captive births last 12 months: 0 Deaths first 30 days: 0

Psophia viridis/DARK-WINGED TRUMPETER/

HONOLULU 0. 2. 0(0)	TORONTO 1. 1. 0(0)	TOKYOUENO 0. 0. 1(0)

Total held: 1.3.1 Number of institutions: 3 Captive Born: 0% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Family Totals: 26.35.18 Captive Born: 58% Wild Born: 15% Captive births last 12 months: 17 Deaths first 30 days (of captive birth): 1

Family - *Rallidae*/RAILS, MOORHENS, COOTS/

Amaurornis phoenicurus/WHITE-BREASTED WATERHEN/

AMSTERDAM 1. 3. 0(0)	DUDLEY 1. 1. 0(0)	SAARBRUCK 0. 0. 3(0)	DENVER 1. 1. 0(0)	FRANKLINP 1. 1. 2(0)	LOWRY 1. 1. 0(0)
METROZOO 0. 1. 8(7)	OMAHA 1. 1. 5(0)	PITTS CA 0. 1. 0(0)			

Total held: 6.10.18 Number of institutions: 9 Captive Born: 76% Wild Born: 3% Captive births last 12 months: 7 Deaths first 30 days: 1

Aramides cajanea/GREY-NECKED WOOD RAIL/

CLEVELAND 0. 1. 0(0)	COLO SPRG 0. 1. 0(0)	FRESNO 0. 0. 2(0)	LOSANGELE 0. 0. 6(0)	LOWRY 1. 1. 0(2)	OMAHA 1. 1. 2(0)
S BARBARA 2. 2. 4(6)	SAN FRAN 0. 0. 2(0)	SANDIEGOZ 0. 0. 1(0)	SANJOSEBZ 0. 0. 2(0)	TOLEDO 0. 1. 0(0)	

Total held: 4.7.19 Number of institutions: 11 Captive Born: 90% Wild Born: 3% Captive births last 12 months: 8 Deaths first 30 days: 1

Aramides ypecaha/GIANT WOOD RAIL/

BANHAM 1. 1. 0(0)

Total held: 1.1.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

Gallinula chloropus (no subsp)/COMMON GALLINULE/

AALBORG 2. 2. 6(0)	ANTWERP 0. 0. 8(0)	BARCELONA 0. 0. 3(0)	LODZ 0. 0. 2(0)	PRETORIA 0. 1. 0(9)	ASDM TUSC 0. 0. 9(9)
AUDUBON 0. 0. 2(0)	BALTIMORE 0. 1. 0(0)	BROWNSVIL 0. 0. 1(0)	FORTWORTH 5. 1. 4(0)	OMAHA 3. 3. 2(0)	PALM DES 1. 1. 5(6)
PARAMUS 0. 0. 2(0)	PHOENIX 1. 1. 0(0)	ROCHESTER 0. 0. 1(0)	WILMINGTN 1. 1. 0(0)	CALI 0. 0. 2(0)	RIYADH 0. 0. 3(0)
TALLIN 0. 0. 5(5)					

Total held: 13.11.55 Number of institutions: 19 Captive Born: 67% Wild Born: 11% Captive births last 12 months: 29 Deaths first 30 days: 11

Gallinula chloropus cachinnans/GALLINULE/

BROWNSVIL 0. 0. 1(0)	CINCINNAT 0. 0. 1(0)	HOGLE 1. 0. 0(0)	PARAMUS 0. 1. 4(0)	SYRACUSE 0. 0. 1(0)

Total held: 1.1.7 Number of institutions: 5 Captive Born: 67% Wild Born: 22% Captive births last 12 months: 0 Deaths first 30 days: 0

Gallinula tenebrosa/DUSKY MOORHEN/

RIYADH 0. 0. 3(0)

Total held: 0.0.3 Number of institutions: 1 Captive Born: 0% Wild Born: 0% Captive births last 12 months: 0 Deaths first 30 days: 0

CRANE
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Participants' First Draft Report

from a Collaborative Workshop
held 9-15 August 1992
Calgary, Alberta, Canada

SECTION 4

REFERENCE MATERIALS

Essay

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

GEORGINA M. MACE

Institute of Zoology
Zoological Society of London
Regent's Park, London NW1 4RY, U.K.

RUSSELL LANDE

Department of Ecology and Evolution
University of Chicago
Chicago, Illinois 60637, U.S.A.

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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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).

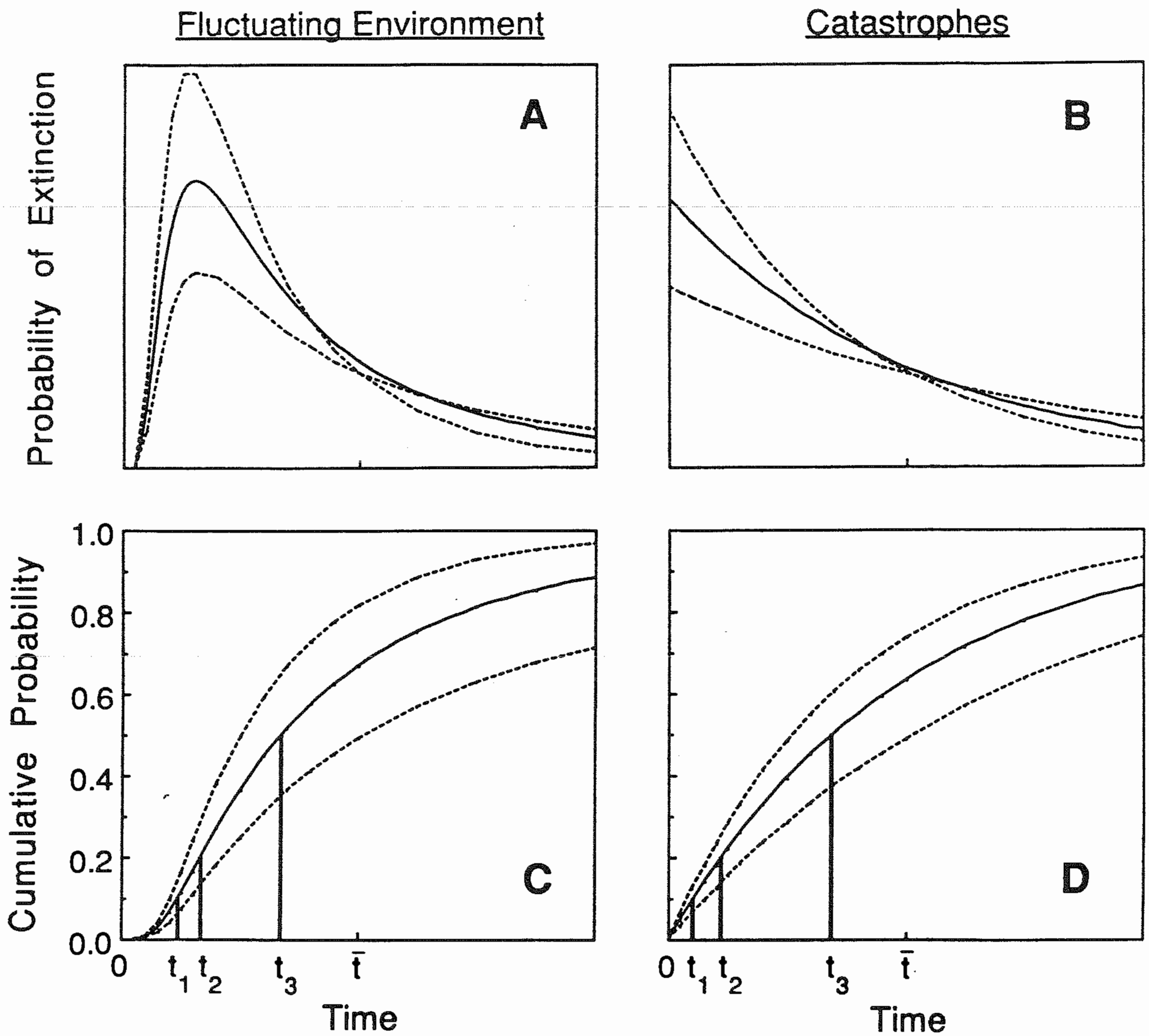

Figure 1. Probability distributions of time to extinction in a fluctuating environment, inverse Gaussian distributions (A), or with catastrophes, exponential distributions (B). Corresponding cumulative extinction probabilities of extinction up to any given time are shown below (C and D). Solid curves 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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CRANE
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Participants' First Draft Report

from a Collaborative Workshop
held 9-15 August 1992
Calgary, Alberta, Canada

SECTION 5

APPENDICES

APPENDIX I.

Crane CAMP Workshop Delegates
Calgary
10-15 August 1992

Ms. Bubphar Amget
Wildlife Conservation Divison
Royal Forest Department
Paholyothin Road, Bangken
Bangkok 10900, Thailand

Dr. Natasha Anzigitova
All-Union Research Institute of
Nature Conservation & Reserves
Vilar, Sadki-Znamenskoye
Moscow 112682, Russia

George Archibald, Director
International Crane Foundation
E-11376 Shady Lane Road
Baraboo, WI. 53913 USA

Frederick Beall
Baltimore Zoo
Druid Hill Park
Baltimore, Maryland 21217 USA

Rob Belterman
Diergaarde Blijdorp
Van Aerssenlaan 49
3039 KE, Rotterdam, The Netherlands

Bob Cooper
Calgary Zoo
P.O. Box 3036, Station B
Calgary, Alberta T2M 4R8, Canada

Pat Cooper
Calgary Zoo
P.O. Box 3036, Station B
Calgary, Alberta T2M 4R8, Canada

Roger Edwards
Canadain Wildlife Service
4999 98th Avenue
Edmonton, Alberta T6B 2X3, Canada

Luud Geerlings
Stichting Crax
P.O. Box 1312
6201 BH Maastricht, The Netherlands

Susan Haeffner
Denver Zoological Gardens
City Park
Denver, CO. 80205 USA

Dwight Knapik
Calgary Zoo
Devonian Conservation & Research Center
Dewinton, Alberta, Canada

Jerry Korn
1510 Happy Valley Road
Nampa, Idaho 836651 USA

Frank Lehmann
Franz-Joseph STR. 26
8000 Munchen 40, Germany

James Lewis
U.S. Fish & Wildlife Service
P.O. Box 1306
Albuquerque, NM. 87103 USA

Liu Dajan
Shenyang Zoo
Shenyang, Liaoning, China

Mohammad Mumtaz Malik
Conservator (Wildlife)
Forest Office
Shami Road
Peshawarn, Pakistan

Claire Mirande, Cuurator of Birds
International Crane Foundation

E-11376 Shady Land Road
Baraboo, WI. 53913 USA

Sharon Moen
Captive Breeding Specialist Group
12101 Johnny Cake Ridge Road
Apple Valley, MN. 55124 USA

Vladimir Panchenko
Oka State Reserve
P/O Lakash, Spassky Region
Ryasan District 391 072, Russia

Geer Scheres
Cracid Breeding & Conservation Center VZW
3620 Lanaken, Belgium

Tom Schneider, Curator of Birds
Detroit Zoological Park
P.O. Box 39
Royal Oak, MI. 48068 USA

Allan Shoults
Calgary Zoo
Devonian Conservation & Research Center
Dewinton, Alberta, Canada

Ulysses Seal, Chairman
Captive Breeding Specialist Group
12101 Johnny Cake Ridge Road
Apple Valley, MN. 55124 USA

Victoria Shaw
International Crane Foundation
Member - Board of Trustees
14 East 75 Street
New York, NY 10021 USA

Ms. Suwin Sittibutara
Wildlife Conservation Divison
Royal Forest Department
Paholyothin Road, Bankan
Bankok 10900, Thailand

Mike Taylor
White Oak Plantation
726 Owens Road
Yulee, FL. 32097 USA

Greg Terry
Calgary Zoo
P.O. Box 3036, Station B
Calgary, Alberta T2M 4R8, Canada

Harrie Vredenberg
Faculty of Management
University of Calgary
2500 University Dr., NW
Calgary, Alberta T2N 1N4, Canada

Wang Qishan
Dean of Biology Department
Anhui University
#3 Feixi Road
Hefei, Anhui 230039, China

Tsuyoshi Watanabe
Hokkaido College, Senshu University
Bibai, Hokkaido 079-01, Japan

Rick Wenman
Calgary Zoo
P.O. Box 3036, Station B
Calgary, Alberta T2M 4R8, Canada

Frances Westley
McGill University
1001 Sherbrooke St. W.
Montreal, Quebec H3A 1G5, Canada

Zhao Qingguo
Chinese Association of Zoological Gardens
9 San Li He Avenue
Beijing, China