SLIMS: An Information Management System for Promoting the Conservation of Snow Leopards and Biodiversity in the Mountains of Central Asia

Full Text

Introduction

Delegates to the Fifth International Snow Leopard Symposium in 1986 considered status surveys and the identification of high altitude habitat for inclusion in protected areas as the critical element in the conservation of snow leopard (Freeman 1988). In its acknowledged role as the international organization for disseminating information on snow leopards, the International Snow Leopard Trust (ISLT) has long recognized the need for a standardized methodology to estimate snow leopard and prey species abundance, and to evaluate habitat conditions, especially within protected areas. Ideally, such protocol must embody methods which are consistent and relatively easily applied by persons of differing skill or interest, from research biologists to protected area managers or even wildlife rangers working under the diverse conditions found across the cat's vast range. The importance of addressing conflicts due to depredation of livestock is also widely acknowledged (Miller and Jackson 1994; Oli et al. 1994).

Few would dispute the fact that snow leopards inhabit the world's most remote and inaccessible region, occurring in the mountain ranges across 12 countries in Central Asia. This alone makes it very difficult to obtain current information on the status and distribution of this species or its major prey over its more than 3 million km2 potential range. The task of mapping snow leopard distribution and estimating numbers on a country-wide basis becomes truly monumental when one considers how shy and elusive snow leopards are. In most areas, the species tends to be sparsely distributed and rare, and its pugmarks or scrapes are few in number, difficult to find or irregularly distributed. The census technique employed to estimate population size varies according to the knowledge and skills of the particular observer, so that it is hardly surprising that estimates vary widely for the same country and even within a small area.

In late 1990, ISLT initiated work on developing a standard survey and database system for gathering, managing and disseminating information on snow leopards, their prey and habitat. The result was SLIMS or the Snow Leopard Information Management System, a procedure developed with assistance from Trust partners in Pakistan, India, Nepal, China, Mongolia and Russia, as well as the United States Fish and Wildlife Service and the National Biological Service (NBS). Delegates to the 7th International Snow Leopard Symposium (1992) urged all countries having snow leopard populations to join SLIMS for "gathering fundamental data that could then be used in critical and crucial decisions regarding the conservation and management of snow leopard reserves" (Fox and Jizeng 1994).

SLIMS is currently being implemented in Pakistan and Mongolia, with similar programs expected to be operational within the next year for India and China. SLIMS embraces an integrated package of field survey and computer database procedures, developed and implemented under the overall umbrella of Project Snow Leopard (Freeman et al. 1994, Hunter et al. 1994). The program is primarily designed to strengthen snow leopard conservation and management within or near protected areas, of which there are more than 135 across the snow leopard's range. Green (1994) reviewed management issues and status for 47 protected areas known to support snow leopards, and found baseline scientific information to be lacking in nearly all reserves.

Project Snow Leopard was endorsed unanimously by delegates from 13 countries to the last Symposium, held in 1992 in Xining, China. It is structured around the belief that the snow leopard may serve as an indicator of environmental quality for Central Asia's high altitude ecosystems: by protecting snow leopards, so habitat for a multitude of other plants and animals is guaranteed. PSL is carried out through four elements: technology transfer and institution building, workshops and collaborative surveys; environmental education and community conservation initiatives; and symposia like this, held every 3 years.

A comprehensive network of protected areas and corridors is critical to the long-term conservation of snow leopards, and the best available scientific information must be used to formulate protection and biodiversity conservation plans (ISLT, Strategic Plan, 1995-2000). This plan envisages ISLT as most effective when serving as a catalyst working in partnership with individuals, NGOs, academic institutions and government agencies in the snow leopard range countries.

Objectives, Overall Structure, and Implementation of SLIMS

SLIMS is an integrated database and standardized field survey procedure for (a) assessing snow leopard/prey species status, distribution and relative abundance; (b) evaluating habitat and species protection status, and (c) promoting improved management of protected areas harboring snow leopard and their prey, as well as unprotected areas offering significant potential habitat for the species. When fully implemented, SLIMS proposes the establishment of one or possibly two in-country computerized installations and supporting procedural documentation in each of the twelve countries that support a wild snow leopard population. A key objective of the program involves regular exchanges of information between the central facility (housed at the Trust's headquarters in Seattle) and the regional country offices through newsletters like Snow Line, digital file exchanges, workshops and special meetings at each of the triennial symposia. Another objective is the development of a "home-page" on the World Wide Web of Internet, which could be accessed worldwide. ISLT is exchanging information with the World Conservation Monitoring Centre's Protected Areas Data Unit (PADU) in Cambridge, England.

To implement SLIMS, ISLT enters into a collaborative agreement with an in-country conservation NGO, the governmental agency responsible for protected areas management, or an appropriate research institution. To date, agreements have been signed in Pakistan (WWF-Pakistan), Mongolia (MACNE - Mongolian Association for Conservation of Nature and Environment) and India (Wildlife Institute of India). Other countries will be brought into the network contingent upon the availability of funding and interest shown by the wildlife agencies or NGOs managing and conserving in-country wildlife resources. The program is being implemented in association with the National Biological Service's Midcontinent Ecological Science Center (MERC) based in Fort Collins, Colorado. The NBS is primarily responsible for software development, hardware installation, computer training, and co-sponsoring the field training workshops described below.

ISLT supplies each facility or node with a PC 386 or 486 computer and associated hardware, as well as standardized relational database and word-processing software. All database software operates under a customized Windows shell using Access (Microsoft Inc.) and developed by the National Biological Service, thus facilitating ease of use by non-specialized computer users. The collaborative agency is provided with a small grant to help cover salary for a computer operator/database manager for an initial period of up to three years, after which the facility is expected to be largely self-supportive. The total dollar cost of establishing and operating a country node over a three year period, including all software, hardware, computer and field training, and salaries for in-country staffing runs as high as $30,000, the bulk of which has been provided by ISLT and NBS. In-country partners provide staff, office space, administration and other vital support enabling SLIMS.

In developing the linked field procedures and database software, ISLT and NBS have sought (not always successfully) to develop a system that is relatively simple, that facilitates the exchange and transfer of data, that is modular and PC-based (personal computer), and that is as user-driven as possible. As an evolving system, the database will be regularly revised to respond to needs as these emerge from the field biologists and park managers applying SLIMS. Other important considerations in developing and implementing SLIMS include assumptions that:

(1) It provides a useful and needed tool to protected area managers and biologists;

(2) Participating agencies and countries agree to exchange information among themselves regarding snow leopard status, distribution, management and resolution of people-wildlife conflicts resulting from livestock depredation, among other topics;

(3) ISLT and NBS are responsive to the basic needs of users (e.g., by incorporating user-recommended refinements in future revisions of the software and field technique manual, or by seeking funds for field surveys and database enhancement);

(4) SLIMS strengthens linkages between the conservation of snow leopards, biodiversity protection and optimal management of mountain ecosystems and resources, and

(5) SLIMS offers an accurate and functional "picture" of relevant environmental conditions and factors across the snow leopard's full range.

Technical Considerations

Hardware and Software: The typical hardware configuration for SLIMS consists of a 386 25 megahertz or a 486 66 megahertz computer with a 350 or 500 megabyte hard-drive, a VGA monitor, a modem, and a low-cost laser printer. The customized SLIMS computer program is a Microsoft Windows (version 3.1) PC-based application which provides an easy-to-use point and click interface to a relational database (Access, Microsoft, Inc.). Simple pull-down menus have been installed to allow for short-learning curves and use by persons with limited prior computer experience. SLIMS allows the user to select a country in which the snow leopard occurs, select a reserve from a list of those in the country and view or edit administrative, biological, physical, and usage data. It also provides help screens, on-line database field keys, and can generate commonly-used types of reports. Most persons are able to input, edit and sort data within several hours of being introduced to the system.

The program was initially written in the C++ program language using a library of C functions (called the Paradox Engine) to access a Paradox database. It has been rewritten as a Microsoft Access application and the database has been converted into Access internal format. The main advantage of using Access as a development platform is that it provides high-level programming tools that are specific to database operations. Implementing these types of operations in C++ requires hundreds of lines of code and numerous calls to the Windows internal functions. The amount of code needed to implement SLIMS in Access is considerably less, with the logic being easier to understand since database operations are directly linked to the graphical objects that display data.

The SLIMS database is relational with the reserve or protected area as the basic unit. Each country in the database has six specific tables which include: (1) a table of administrative data with one record for each reserve (currently 32 fields such as reserve location, size, status, management authority, staffing, and contact addresses; see Table 1*); (2) a table for physical elements of importance such as climate and relevant physical features, also with a single record for each reserve (24 fields; see Table 2*); (3) a table of biological data including biogeographical zone, vegetation types, and habitats but not including species (see below) with a single record per reserve (11+ fields; see Table 3*); (4) a table of human-use information relevant to protected area management, such as type of protected area, zonation, or proposed extensions, the number of human settlements both inside and adjacent to the reserve, a list of natural resources currently being harvested, the key management concerns and issues, status of important people-wildlife conflicts like crop damage, depredation and livestock grazing, environmental impacts due to resource extraction or tourism, and income-generating activities and opportunities, also with one record for each reserve (more than 25 fields; see Table 4*); (5) a table of species data with one record for each species and each reserve in which it occurs, including estimated numbers and density (9+ fields, see Table 5*), and (6) a table of significant species with one record for each species considered "significant" in that country. In addition, there are two "master tables" which contain data for the entire snow leopard range. These are: (a) a table of all countries which links each country to the names of its administrative, biological, usage and species tables, and (b) a table of species which contains names and codes for the species within the snow leopard range and a classification of these species as "Large Prey," "Small/Medium Prey," "Predator," or "Other" (see Table 6*).

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*All Tables may be found at the end of this article.

The database is modular in that all tables for a specific country can stand alone as a complete database of reserve-based snow leopard data for that country. These data tables can be developed using another database management system (DBMS) and can be imported into Access tables for that country as long as the table structures adhere to the standard SLIMS format. Access is capable of importing data from most other common PC DBM systems, as well as importing data as comma-delimited or fixed width text files. Export capabilities are similarly broad.

Future versions of SLIMS software will include a field data table intended to store information accruing from standard field surveys, including the names of survey sites, number of transects conducted, sign frequency, prey census observations, and so forth (about 40 fields; see Table 7). As information on different reserves accumulates, so ISLT hopes to develop a database for assessing snow leopard conservation at the landscape-level and regional levels, possibly by integrating SLIMS with a GIS (geographic information system). This would allow, for example, the Trust and its collaborators to evaluate conservation priorities across borders, including the importance and effectiveness of transboundary protected areas, identification of naturally-linked protected area clusters, or delineating the amount of unprotected but critical habitat along corridors between adjacent parks. By incorporating various descriptors of ecological capacity, including protected area or habitat unit size, disturbance levels, distance to the nearest reserve of various size, and placement relative to corridors, scientists and decision-makers could better assess gaps in reserve coverage for snow leopard and other high altitude species. This element of SLIMS would be supported by hard-copy maps of the type described by Hunter and Jackson, "A Range-Wide Model of Potential Snow Leopard Habitat" found in this volume.

Finally, nodes will maintain relatively detailed text-based files (in Wordperfect or Word format) which focus upon specific reserves, and conservation or management issues of interest. These are intended to supplement the information contained in the world-wide protected areas data-base being maintained in Cambridge by PADU (WCMC), and accordingly they have similar subject headings and formatting.

Field Survey Training Workshops: Field Methods Training Workshops to promote standardized information gathering are the first priority of SLIMS. These train in-country biologists in survey and park management techniques using a "hands-on," participatory teaching approach. Class exercises and specially designed games help facilitate group discussion and interaction between individuals. Students are trained at two levels: First Order Surveys, in which predator/prey species presence or absence is established, and Second Order Surveys aimed at determining the relative abundance of snow leopard using sign transects and ungulate population size using fixed-point censuses, by extrapolating from randomized block sampling. Training occurs in areas supporting snow leopards, so that workshop participants obtain first-hand experience with locating and correctly identifying snow leopard sign. Standardized data forms are completed, with the resulting information being entered into the SLIMS computerized database described above. Students are also trained in habitat characterization and management needs assessment, using sampling as well as interview methods. Finally, they are given the opportunity to analyze the data they have collected, to report on local attitudes toward wildlife and to offer action-based recommendations for protecting snow leopard and other rare species in the area surveyed. Maps showing the location of transects and census blocks are provided whenever possible.

Each workshop lasts 10-12 days and may be followed by a special joint survey whereby instructors and some students survey snow leopard, prey and habitat status in an area considered nationally significant, but lacking in reliable or current information. Each student is provided with a comprehensive Snow Leopard Survey and Conservation Handbook (Jackson and Hunter 1995), as well as supporting materials covering a wide range of topics from how to keep good field notes to how livestock suspected of being killed by wild predators can be validated and the identification of critical wildlife habitat and corridors linking adjacent protected areas. Students are also provided with guidelines for assessing biodiversity and protected areas coverage, reducing poaching and controlling trade in animal parts (a major threat to snow leopards), and options for alleviating conflicts due to livestock depredation by snow leopard.

To date, training workshops have been held in Gansu Province, China (August 1993), the North-West Frontier Province of Pakistan (June 1994), Mongolia (October 1994), and Bhutan (May 1997). All field training has been conducted in important national protected areas such as the Chitral Gol National Park of Pakistan, or the Great Gobi Strict Protected Area of Mongolia, and all workshops have involved persons working across the snow leopard's range in areas of the particular host country. To date, field techniques training has been provided to 26 biologists and park managers, while a similar number of agency officials and other protected area staff have attended classroom sessions in which overall conservation issues and strategies are discussed.

Discussion and Conclusions

Lessons Learned: Just over two years have passed since the first training workshop was held in China. Although SLIMS is still in its infancy, we can offer some important conclusions regarding both its strengths and potential weaknesses. Workshop participants have endorsed the need for consistent survey techniques, and have generally found the training helpful to developing their technical skills or enhancing their job opportunities. The desire on the part of participants for further training in wildlife, conservation and management skills has been consistently voiced, thus supporting the importance of the Trust and its partners offering follow-through joint field surveys and workshops. These are also useful to the exchange of ideas between individuals, identification of potential problems, collaborative problem solving, and for the long-term refinement of SLIMS. Although the process of strengthening the local capacity of protected areas and improving conservation of rare mountain species has just begun, the long-term benefit of linking SLIMS to protected areas management is clear. From a broader perspective, it is too early to determine if the various individuals, agencies or countries will regularly exchange information among themselves and the Trust, or across national boundaries.

Discussions with in-country researchers, reserve managers and other agency officials indicate there are several important constraints which could undermine the long-term effectiveness of SLIMS, unless these are adequately addressed by all involved partners. Wildlife and park departments usually lack sufficient trained staff to adequately meet their basic responsibilities, let alone for conducting wildlife surveys in remote areas. It is therefore not surprising that all SLIMS collaborating countries have indicated serious constraints on their ability to mount field surveys and to gather information from more than one or two of the reserves under their jurisdiction. Thus far, only Mongolia has been able to conduct extensive regional surveys, in large part because it benefits from a foreign-supported snow leopard research project (McCarthy and Munkhtsog, this symposium). Any activity requiring a significant amount of field work or baseline data gathering nearly always faces severe financial constraints and is thus difficult for most staff biologists to undertake or justify for approval by their superiors. Many of the areas considered important to snow leopard or wild ungulate conservation are rugged, remote and difficult of access. Agencies may be severely hampered by a lack of vehicles and fuel for transporting their staff to field sites, and their staff likely lack adequate equipment (e.g., altimeters and sighting compasses), camping supplies (tents and sleeping bags) or cold-weather clothing. If field surveys are conducted, there is typically a bias toward surveying more accessible sites, but of course these may not support the best snow leopard habitat being subject to higher levels of human disturbance.

Computer database management training may be lacking or inadequate for the task at hand, while the staff assigned to the program may technically be unable to rectify any failure in the hardware or software. Constrained by a small budget, supervisors are often reluctant to spend their allocation on activities they see as secondary or being an unnecessary luxury. Under pressure to generate revenues for the government, they are naturally more concerned about improving income-generating opportunities associated with wildlife or reserves, such as trophy hunting and tourism, than in encouraging research. In any such crisis situation, it is easy to overlook the importance of information gathering and scientific research (MacKinnon et al. 1986). Much of course depends upon the special interests and motivation of individuals serving as agency head or the particular protected areas supervisor. Some managers are more skilled at leveraging limited funding, or better able to perceive the potential benefit accruing from baseline information-gathering and environmental baseline monitoring.

China is a very significant snow leopard country, containing about 60% of the total potential habitat for the species, and is a focus for traditional medicines relying upon animal parts (including those from snow leopard). Implementing SLIMS in China has presented a particular challenge to the Trust, for protected areas management authority is not vested within a single agency, as it is in the case of Mongolia or Nepal. The five provinces and autonomous regions containing snow leopard manage their protected areas with little or no contact with neighboring agencies or governmental bureaus, although each may face similar problems and issues, and some protected areas are even contiguous. Furthermore, China lacks a centralized body mandated or dedicated to supporting protected areas by promoting action and management-based research; typically, research is undertaken by scientific academies, which tend to be overly academic or theoretical in their approach to research. For SLIMS to operate effectively throughout the snow leopard's range in China, computer facilities or nodes may have to be established in each region: this is clearly beyond the present financial capabilities of ISLT, so it is concentrating upon establishing the first node in Gansu Province. A major constraint in this regard is the fact that Gansu contains very little snow leopard habitat. However, this province has clearly demonstrated a strong interest in SLIMS by hosting the first country-wide snow leopard field training in China, and thus merits the Trust's attention. Two staff from Gansu's wildlife office have visited the US on a scientific exchange, receiving training at the NBS facility in Fort Collins, as well as examining various wildlife conservation and research projects in Montana, Wyoming and Washington. The Trust anticipates that SLIMS will be easier to install and operate in countries like Pakistan or Mongolia where a single or a few agencies are vested with the authority to manage the nation's parks and reserves, and in India where there is a national institution (Wildlife Institute of India) specifically mandated to train its wildlife and protected area professionals, and to promote research on a wide range of subjects relevant to conservation.

Future Directions: SLIMS field techniques largely emphasize biological aspects, with insufficient emphasis upon the systematic gathering of socio-economic data vital to resolving conflicting resource needs, the development of special buffer zone management plans, or comprehensive community development programs in exchange for the biodiversity services rendered by the people living in or near a protected area. It is becoming increasingly clear that protected areas face a very uncertain future unless they address the concerns of local people and develop socially-sensitive yet ecologically compatible management plans (see, for example, Cernea 1991; McNeely and Miller 1984; McNeely 1993; Western and Wright 1994). Too often scientists and biologists fail to involve local people in the process of information gathering and monitoring, thus failing to seek their opinions for avoiding current or future conflicts with government agencies or management authorities. A training component covering the gathering of socio-economic information (such as participatory rural appraisal or PPA) should be incorporated into SLIMS protocol, while supervisory-level staff should be encouraged to attend at least one or two days of the classroom session. This will enable the Trust and its collaborators to better influence policy relating to endangered species as well as promoting region-wide coordination and cooperation. In order for SLIMS to continue to grow and increase its effectiveness as a tool for helping conserve snow leopards and biodiversity in the mountains of Central Asia, it will need to evolve its set of standardized techniques to include the assessment of overall biodiversity status and threat in mountain ecosystems.

Conclusions: In implementing SLIMS across such a politically and culturally diverse area, the Trust believes that success or failure rests in large part upon the strength of partnerships developed with each country. In order to satisfy the unique conditions that occur in each of the 12 snow leopard countries, the Trust must seek tailor-made institutional and collaborative arrangements with those governmental agencies, NGOs and scientific institutions best positioned to address snow leopard conservation. These may range from organizations with few employees to a government agency committed to establishing innovative flagship parks for the species, or the newly emerged conservation NGO that demonstrates a particular skill for gathering information vital to biodiversity conservation in the region in question.

Although SLIMS was launched under Project Snow Leopard in 1992 at the 7th International Snow Leopard Symposium, work on building databases is

only just beginning. We must appreciate that gathering information on the rare species and wildlife inhabiting Asia's mountain ranges is not a simple undertaking, but rather one fraught with uncertainty and many obstacles that will have to be addressed and overcome.
There is a popular maxim among professionals involved in information gathering and dissemination to the effect that the world is afloat in proprietary databases, most of which lie unused on a shelf, gathering dust; very few end up maturing and living to an old age, as it were, or even serving their intended purpose. A database application is best judged by how it is being used and to what extent its users are controlling its design, use and implementation, rather than on purely technical specifications or comparisons to competing systems. The ultimate users of SLIMS must play a greater role in driving the system and in reaping its potential benefits, without ending up burdened and wasting your valuable resources. To this end, we should be very clear about the role that each partner could and should play in the management and dissemination of information on snow leopards, their prey and their habitat.

The Trust's role is as a catalyst and central repository for information across the snow leopard range. The in-country partner or partners maintain the detailed information databases on snow leopard and mountain protected areas for each of the participating countries. This is the purview of the in-country partner or partners to the SLIMS agreement. Since SLIMS is primarily intended as a tool for reserve managers, it is imperative that they, as the users, direct future development of the system. Along with their agencies, they must take the initiative and seek support for information gathering and take advantage of the exchange opportunities offered by SLIMS, the Trust and its diverse collaborators. They must let the Trust know what works and what does not, and they must find ways of undertaking field surveys, inventories, or monitoring in participation with the Trust and local people living in the area. Ultimately, the success of SLIMS and international cooperation rests with the free exchange of ideas, information and knowledge to solve problems of mutual interest to all of us attending this symposium.

In conclusion, it is the goal of ISLT and the authors for SLIMS to evolve as a fully cooperative and participatory venture that could serve as a model for other rare species which occupy large home ranges or occur across several countries, such as the critically endangered tiger.

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Table 1: Administration File Content

Field Name	Field Type	Form	Description
ResNo	N	Numeric	Fixed Reserve Number
Reserve	A20	Full text	Protected Area (Reserve) Name
Pseudonym	A20	Full text	Other Names
Status	A5	Code	Status of Protected Area
Cat 1	A7	Code	Type of Protected Area (India)
Cat 2	A7	Roman Num.	Type of Protected Area (IUCN)
Legal	A3	Code	Legal Status
Date	D	Date	Date Notified or Intent Filed
Country	A3	Code	Country Code (IN = India)
Province	A3	Code	Province Name
District	A11	Full Text	District Name
Agency	A25	Full Text	Govt. Agency responsible for mgmt
Address	A75	Full Text	Address of Govt. Agency
ContactName	A15	Full Text	Name of Contact Person
ContactTitle	A30	Full Text	Title of Contact Person
ExistArea	N	Numeric	Total Existing Area (km2)
ExistZone	A5	Code	Existing Zoning
PropZone	A5	Code	Proposed Zoning
ExpansionPlan	A5	Code	Plans for Expansion
P Cat	A9	Code	Proposed Category
Priority	A2	Roman Num.	Government Assigned Priority
Tot F Area	N	Numeric	Total Future Area (km2)
Area NP	N	Numeric	Total Area in National Park (km2)
Area WS	N	Numeric	Total Area in Wildlife Sanctuary (km2)
Area Buf	N	Numeric	Total Area in Buffer Zone (km2)
Mgmt Plan	A2	Code	Status of Management Plan
Budget	A15	Code	Status of Budget
Budget Year	A10	Alpha-num	Effective Date(s) of Budget
Staff	A4	Number	Number of Staff Assigned to Reserve
Grades	A30	Code	Grades of Staff Assigned to Reserve
Date-Log1	A18	Alpha-num	Date of Last Entry
Ref-1	A30	Alpha-num	Major References Used

Table 2: Physical Features File Content

Field Name	Field Type	Form	Description
Res No	N	Numeric	Reserve Number (Key Field)
Reserve	A20	Full text	Reserve Name (Key Field)
Province	A3	Code	Province Name
Elev-Min	N	Numeric	Lowest Elevation (meters)
Elev-Max	N	Numeric	Highest Elevation (meters)
Temp-Min	N	Numeric	Minimum Recorded Temperature
Temp-Max	N	Numeric	Maximum Recorded Temperature
Temp-Avg	N	Numeric	Average Annual Temperature
TotPrecip	N	Numeric	Total Annual Precipitation (mm)
Rain	N	Numeric	Total Rainfall (millimeters)
Snow	A7	Numeric	Total Snowfall (millimeters)
Precip-Season	A4	Code	Season with Most Precipitation
DrainNo.	N	Numeric	Number of Major Drainages
DrainNames	A12	Full text	Names of Major Drainages
MajRange	A20	Full text	Names of Major Mountain Ranges
MinRange	A20	Full text	Names of Minor Mountain Ranges\
Topo	A3	Code	Dominant Topography
Lat-From	N	Numeric	Beginning Latitude
Lat-To	N	Numeric	Ending Latitude
Long-From	N	Numeric	Beginning Longitude
Long-To	N	Numeric	Ending Longitude
Maps	A20	Full text	Map Sheet Numbers
Date-Log2	A18	Alpha-numeric	Date of most recent entry
Ref-2	A20	Alpha-numeric	References Used

Table 3: Biological Elements File Content

Field Name	Field Type	Form	Description
Res No.	N	Numeric	Fixed Reserve Number (Key Field)
Reserve	A20	Full text	Reserve Name (Key Field)
IUCN Bio Prov	A7	Code	IUCN Biogeographical Province
Ind Zone	A2	Code	Rodgers & Panwar (1988)

			Biogeographic Zone
Ind Bio Prov	A2	Code	Rodgers & Panwar (1988) Biotic Province
Sig Biomes	A40	Code	Significant Biomes
Biome No.	N	Numeric	Total Number of Biomes
Veg Type	A200	Code	Vegetation Types
Veg No.	N	Numeric	Total Number of Vegetation Types
Log-Date3	A18	Alpha-num	Date of Last Edited
Ref-3	A20	Alpha-num	References Used

Table 4: Human Use and Protected Area Management File Content

Field Name	Field Type	Form	Description
Res No	N	Numeric	Fixed Reserve Number (Key Field)
Reserve	A20	Full text	Reserve Name (Key Field)
Uses	A45	Code	Habitation and Use (see key below)
Village In	N	Numeric	Villages within Reserve Boundary
People In	N	Numeric	Population within Reserve Boundary
Village Near	N	Numeric	Villages in Buffer or Immediately Outside Boundary
People Near	N	Numeric	Population in Buffer or Immediately Outside Boundary
Cult	N	Numeric	Amount of Cultivated Land Within Reserve (hectares)
Season Use	A10	Code	Primary Season of Reserve Use
GrazPerm	A5	Code	Issuance of Grazing Permits
Stock In	N	Numeric	Number of Livestock Within Reserve Boundary
Stock In/Near	N	Numeric	Number of Livestock Within Reserve and in Buffer Zone (just outside park boundaries)
Stock Out	N	Numeric	Number of Livestock within in Buffer or Just Outside Reserve Boundaries Only
Depred	A15	Code/Number	Number of Livestock Lost to Predators
Illegal Acts	A40	Code	Illegal Activities Within Reserve
Mgmt Issues	A35	Full text	Key Management Issues
ComInvol	A5	Code	Community Involvement
Tourists	A35	Full text	Number and Type of Tourist Visitation
Facilities	A50	Full text	Hotel/Resthouse Capacity
Town Name	A15	Full text	Name of Nearest Town to Reserve Entrance
Town Dist.	N	Numeric	Distance of Nearest Town to Reserve Entrance

Field Name	Field Type	Form	Description
Airport	A20	Full text	Name of and Distance to Nearest Airport
Rail	A20	Full text	Name of and Distance to Nearest Train Station
Log-Date4	A18	Alpha-num	Date of Most Recent Entry or Edit
Ref-4	A30	Alpha-num	Major References Used

Table 5: Reserve Species File Content

Field Name	Field Type	Form	Description
Res No	N	Numeric	Fixed Reserve Number (Key Field)
Reserve	A20	Full text	Reserve Name (Key Field)
Species	A10	Code	Species code (standardized across countries)
UngDens	A10	Number/Code	Density of Large Ungulates
DSpecies	A50	Code	Species for Which Density Applies
Prey Bio	N	Numeric	Biomass of Selected Large Prey
Bio Species	A50	Code	Species for Which Biomass Applies
Log-Date5	A18	Alpha-num	Date of most recent entry or edit
Ref-5	A30	Alpha-num	Major references used

Table 6: Master Species Table

Field Name	Field Type	Form	Description
Species	A10	Code	Species code (standardized across countries)
Sig Species	A100	Code	"Significant" species (determined by each country)
ComName	A20	Text	Common name
SciName	A20?	Text	Scientific (bionomial) name
SLStat	A2	Code	Status of snow leopards
SLPop	N	Numeric	Snow leopard population size
LPrey	A100	Code	Large prey species present
MSPrey	A100	Code	Medium/small prey species present
OtherPred	A100	Code	All other predators present

Log-Date6	A18	Alpha-num	Date of most recent entry or edit
Ref-6	A30	Alpha-num	Major references used

Table 7: Standardized Field Survey File Content

Field Name	Field Type	Form	Description
First-Order Surveys:			
ObsName	A20	Full Text	Observer name
SurName	A20	Full Text	Name of survey area or block
Date	D	Date	Date of survey
Lat	N	Numeric (dec)	Latitude (approximate center of survey area)
Long	N	Numeric	Longitude
Elev-min	N	Numeric	Elevation minimum
Elev-max	N	Numeric	Elevation maximum
BioProv	A10	Code	IUCN Biogeographic province/country zone
SurArea	N	Numeric	Size of area surveyed (km square)
TypeObs	A5	Code	Type of observation
Species	A10	Code	Name of species observed
NoSites	N	Numeric	Number of sites surveyed
Signtype	A5	Code	Type of sign
Signage	A5	Code	Age of sign
SignNo	Numeric	Numeric	Number of sign items observed
Effort	N	Numeric	Search effort (man-days)
Terrain	A10	Code	Dominant landscape
Threat	A25	Code	Threats to snow leopard
BiogeoZ	A10	Code	Biogeographic zone
PreyNo	N	Numeric	Number of prey animals or sign observed
Class	A10	Code	Sex & age- class of ungulates observed (optional)
Vegtype	A20	Code	Vegetation types observed
Habtype	A20	Code	Habitat types observed
Raresp	A25	Code	Rare species observed
Majdis	A25	Code	Major disturbance factors
Att	A25	Code	Local attitude to conservation
Recom	A4	Code	Recommendations made (yes or no)

Ref	A25	Alpha-num	Data source (date/title of report with recommendations made)

Second-Order Surveys:

ObsName	A20	Full text	Observer's name
SurName	A20	Full text	Name of survey block
SurType	A5	Code	Type of survey (snow leopard, prey, habitat)
TransNo	N	Numeric	Transect number
BlocNo	N	Numeric	Census block number
SblcoNo	N	Numeric	Sub-block number
Length	N	Number	Total length of transect (m)
Date	D	Date	Date transect was conducted

Table 7 (continued)

Field Name	Field Type	Form	Description
Lat	N	Numeric	Latitude (decimal degrees)
Long	N	Numeric	Longitude (decimal degrees)
Elev-min	N	Numeric	Elevation minimum
Elev-max	N	Numeric	Elevation maximum
Ruse	A5	Code	Dominant rangeland use
Habtype	A5	Code	Dominant habitat type
Landrug	A5	Code	Dominant landform ruggedness
Featmark	A5	Code	Dominant feature marked
NoSites	N	Numeric	Number of sites with snow leopard sign
RelicNo	N	Numeric	Number relic sites
TotScr	N	Numeric	Total number of scrapes (all ages) observed along transect
FScr	N	Numeric	Total number of fresh scrapes (codes 2 and 3) observed
TotFe	N	Numeric	Total number of feces or scats (all ages) observed along transect
FFe	N	Numeric	Total number of fresh feces (codes 1 and 2) observed
TotPug	N	Numeric	Total number of pugmarks observed along transect
FPug	N	Numeric	Total number of fresh pugmarks (codes 1 and 2) observed
TotSce	N	Numeric	Total number of scent-sprays observed
Substr	A5	Code	Dominant substrate type

Additional Prey species parameters:

Daysamp	N	Numeric	Number of days sampled
BlocSam	N	Numeric	Number of sub-blocks sampled
Preysp	A10	Code	Prey species observed

Herdno	N	Numeric	Total number of herds seen
TotNo	N	Numeric	Total number of individuals seen
Herdmin	N	Numeric	Minimum herd size observed (smallest herd)
Herdmax	N	Numeric	Maximum herd size observed (largest herd)
AFem	N	Numeric	Total number of adult females observed in census block
AMal	N	Numeric	Total number of adult males observed in census block
Yrl	N	Numeric	Total number of yearlings observed in census block
Lamb	N	Numeric	Total number of lambs observed in census block

Table 7 (continued)

Field Name	Field Type	Form	Description
M-1	N	Numeric	Total number of Class I males observed in census block
M-2	N	Numeric	Total number of Class II males observed in census block
M-3	N	Numeric	Total number of Class III males observed in census block
M-4	N	Numeric	Total number of Class VI/V males observed in census block
UnidNo	N	Numeric	Total number of animals not classified to sex and age class
VegType	A5	Code	Dominant vegetation
TopFeat	A3	Code	Dominant topographic feature
SlopPos	A1	Code	Dominant position on slope
MeanElev	N	Numeric	Mean elevation of sightings
MeanSlop	N	Numeric	Mean slope of sightings
DomAsp	A5	Code	Dominant aspect of sightings
DEscp	N	Numeric	Mean distance to escape cover
TypeEsp	A3	Code	Type of escape cover present
DHuman	N	Numeric	Distance to nearest human habitation
TypeHum	A3	Code	Type of human habitation
DRoad	N	Numeric	Distance to nearest road
TypeRoad	A2	Code	Type of road
DLive	N	Numeric	Distance to nearest livestock herd
TypeLive	A4	Code	Type of livestock in herd

Additional Habitat Parameters:

Site Type	A5	Code	Random or use site
ActElev	N	Numeric	Elevation (actual value)
Slope	N	Numeric	Slope (actual value)
Asp	N	Numeric	Aspect (actual value)
DCliff	N	Numeric	Distance to nearest cliff
DWater	N	Numeric	Distance to nearest water source
TypeWater	A5	Code	Type of water source
DHab	N	Numeric	Distance to nearest other habitat type
NHab	A3	Code	Name of nearest habitat type
DLF	N	Numeric	Distance to nearest other landform type
TypeLF	A3	Code	Type of landform type