

ENDANGERED SPECIES

Technical Bulletin Reprint

Wildland Management Center
School of Natural Resources
The University of Michigan

Special Reprint Issue

Aiding the Elusive Snow Leopard

by

Kathleen Rude

Most large wild cats, such as lions, tigers and pumas, aren't strangers to us. They sell cars, promote banks, sponsor running shoes, play sports, make breakfast cereals GREAT, and still draw large crowds to zoos and circuses. At one time their pelts also adorned fur store windows and women, a practice that almost annihilated their populations in the wild.

With so much feline notoriety, it is difficult to imagine that one of the most beautiful of these cats has escaped the limelight. The snow leopard, with its distinctive grey-white spotted coat, hasn't appeared in a single TV commercial or sporting event, nor has it been the subject of substantial research - until now.

The snow leopard is endangered and our knowledge about this animal in the wild is extremely limited. Sparse populations of snow leopards inhabit the mountains of Tibet, the Himalayas of Nepal, India, Bhutan, and Sikkim, the Hindu Kush of Pakistan, the Pamirs of Afghanistan, and ranges along the border of the Soviet Union and the People's Republic of China.

Despite their name and their frosty white coats, snow leopards rarely spend much time in snow-filled areas. Many parts of their range take them to arid places at high elevations where there is little snow in winter. Many of these rugged areas, littered with steep cliffs and deep valleys, are found at

towering elevations between 10,000 and 17,000 feet, making research there extremely difficult and dangerous.

The snow leopard is officially listed as endangered by every country in which it is found. However, enforcement of protective measures varies greatly from country to country. The two biggest threats to snow leopards are competition with local herders and the market value of their pelts.

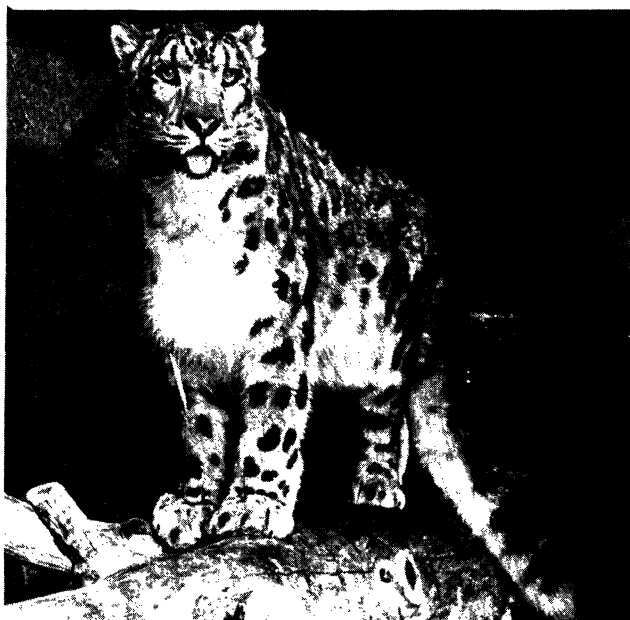
In many areas throughout its range the snow leopard must compete with subsistence herders. Domestic livestock overgraze the alpine habitat, driving out wild prey upon which the snow leopard normally feeds. The snow leopard is then forced to kill the herder's stock for its survival. In some areas the loss of livestock serious-

ly impacts the local economy. As a result, snow leopards are killed by local herders in order to protect their animals and their income. If the snow leopard's pelt can then be sold, the herder may be able to recoup some of his losses.

Like most large cats, the snow leopard's fur continues to be coveted by the fashion industry and trophy seekers. Pelts are still exported out of places such as Kashmir and Tibet, although local wildlife authorities are doing their best to clamp down on this trade. Also, the governments of India and China are increasing their commitments to the elimination of snow leopard exploitation.

The snow leopard's luxurious pelt, which serves as excellent camouflage, is but one of the cat's

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Female snow leopard
on breeding loan
to the Detroit Zoo

photo courtesy the Detroit Zoo

Snow Leopards continued. . .

unique features. The snow leopard has an extremely long tail, accentuated by its relatively small body size of 3 feet. Its paws are also very wide. Once thought to aid in travel over deep snow, these broad paws are actually adaptations to climbing across the many cliffs that occupy the snow leopard's mountainous terrain.

Despite this cat's intriguing appearance, researchers originally shied away from studying the snow leopard because of its secretive habits, sparse distribution, rugged habitat and the political tensions that pervade most of the cat's territory. However, U.S. scientists, along with colleagues abroad, have recently initiated research on this species both in the field and in captivity to help bring this elusive leopard's plight before the public and to save it from extinction.

Himalayan Snow Leopard Project

Rodney Jackson never was a mountaineer by his own admission, but he was forced to become one in order to study snow leopards. Working in a remote study area in Western Nepal, he is required to scale steep cliffs and maneuver around deep gorges that he would otherwise prefer to avoid. Just getting to his study area is arduous: Jackson and his team must hike for ten days up to elevations over 12,000 ft. just to get to their basecamp. No other means of access to this spot are available to them.

For the first time ever, Jackson is successfully radiotracking snow leopards in the mountains to learn about their behavior and habitat needs. He will use this information to develop snow leopard management and conservation plans that can be used by the Nepalese government.

In order to put radio collars on these cats, Jackson must first trap them with a modified leg snare set on leopard trails. He also needs a healthy dose of patience and perseverance because snow leopards use the same trails only once every 2-8 weeks. After an animal is caught, Jackson anesthetizes the animal, takes measurements and then attaches the radio collar. Jackson has collared five leopards and is currently tracking them.

The high mountains make tracking difficult and laborious. The radio signals bounce off the rugged topography, scrambling the readings on exact leopard locations. In order to minimize the bouncing, Jackson has to climb to the highest elevations possible, often up to 17,000 ft., to take readings. Even so, it can take up to one full day just to get an accurate fix on one cat. Because of the time involved, Jackson had to establish several extra camps on these peaks for tracking purposes.

Jackson's study area is located in the proposed Shey-Phoksumdo National Park; it is also in what is called the Restricted Area where

foreigners are not allowed. Jackson has received special permission to conduct research there, but, because of political tensions in the area, he is limited to only three field people to assist him.

Despite the handicap of a small staff, Jackson's work has already helped the snow leopard. As a result of his research, the proposed park will be expanded to include prime snow leopard habitat. This will be the first national park to contain snow leopard habitat and a monitored population.

His study area does provide one major advantage that makes the long hikes, treacherous terrain and staff restrictions more palatable. This part of the country is still relatively uninhabited, so the snow leopards don't have to compete with domestic livestock and aren't threatened by hunting. Jackson maintains that such an area is essential for collecting the baseline data crucial for management plans. These habitat conditions are harder to find than the snow leopard itself, making this research truly a landmark study.

Jackson's work is sponsored by the World Wildlife Fund - U.S., the National Geographic Society, the New York Zoological Society and the International Snow Leopard Trust.

Rodney Jackson is affiliated with the California Institute of Environmental Studies at Davis.

India Mountain Project

Like Rodney Jackson, Helen Freeman isn't crazy about the snow leopard's choice of neighborhoods. Ascending into the mountains of northern India, Freeman rode a horse along a steep path near the cliff's edge. Ice forming on the rocks as the temperatures dropped caused her horse to fall on top of her. Luckily, the horse fell away from the cliff. Freeman decided then and there that in her next life she would study house sparrows. She also decided to walk.



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In May 1985, Freeman will begin her first field season of what promises to be the most comprehensive study of snow leopards ever undertaken. Her research will take place in northern India. From the initial planning discussions through the completion of the project, researchers and government officials from both countries are working together as a team with the goal of having the Indians take control of the monitoring and management activities.

The scope of this study focuses on more than snow leopard biology. Researchers will also concentrate on prey species, the alpine ecosystem and the interactions between snow leopards and human land uses.

One critical aspect of the management plans they will devise is an approach that will allow humans and leopards to live compatibly in their shared territories. Unlike Jackson's study area, grazing is a prominent activity in northern India. Educational conservation programs for local herdsmen will be stressed so that these people can better understand leopard behavior and habitat needs and how their grazing practices impact on the cats. Researchers recognize that local people are a part of the ecosystem and, therefore, will seek their cooperation and consider their economic needs in developing management strategies.

Freeman notes that one difficulty in the region is the mix of religions. Both Muslims and Buddhists occupy land in the snow leopard's range. One challenge here is to find different management strategies that will be acceptable to each religious philosophy.

Nevertheless, Freeman seems to welcome all of the challenges of this immense project. She feels strongly that the snow leopard is "worthy of our research and commitment because the cat has lived cooperatively with humans for centuries until only recently when it was forced into a corner by human activity." She believes that we need to do what we can to ensure that peaceful coexistence between these elusive mountain cats and humans can continue without



Breeding pair
Sonya and
Illyax at the
Detroit Zoo.

photo by Dick Simpson, courtesy of the Detroit Zoo

harm to either member of the Indian ecosystem.

The India Mountain Project is sponsored by the U.S. Fish & Wildlife Service, the government of India, and the International Snow Leopard Trust, headed by Helen Freeman.

Helen Freeman is also Curator of Education at the Woodland Park Zoo in Seattle, which cares for eight snow leopards in its collection.

Species Survival Plan

In addition to her research in the field, Helen Freeman is also involved in captive breeding of snow leopards. Among her many titles, she is the Species Coordinator for the snow leopard's Species Survival Plan (SSP). SSP was created by the American Association of Zoological Parks and Aquariums to strengthen and coordinate captive breeding programs for the continued survival of endangered species in zoos.

As the snow leopard coordinator, Freeman notes that "one of the difficulties we encounter here is the fact that snow leopards can't read. If they could, they

would understand what we are trying to do and be more cooperative." What Freeman wished her cats could comprehend is the Master Plan for snow leopard reproduction that she and Dan Wharton from the Bronx Zoo have devised as required by SSP. This plan makes recommendations to zoos in the U.S. and Canada on which leopards they should breed with leopards from other zoos and on how often they should breed each animal. Studbooks, genetic information and individual life histories of the species are used in determining the pairings.

"Some leopards just don't always cooperate with the mates that have been selected for them," Freeman explains. But, for the most part, this "computer dating" has been successful for the snow leopard so far.

Individual SSP's have been set up for 32 endangered species. Zoos having any of these animals in their collections are invited to join the appropriate SSP and act upon recommendations from the Species Coordinator. An SSP Propagation Group is also established to assist the Coordinator in implementing the master plan.

Each master plan for a particular species manages animals from all participating zoos as one large

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Snow Leopards continued. . .

population. This cooperation encourages the exchange of animals between zoos for breeding purposes and, as a result, will increase the genetic diversity of the entire zoo population. What breeders hope to accomplish with this plan is a reduction in the amount of inbreeding that occurs when the same animals mate exclusively with each other. Inbreeding will eventually reduce reproductive rates and induce undesirable and deleterious traits in offspring.

SSP's also allow zoos that have only one animal or a collection of the same sex to breed their animals without purchasing other individuals. Of equal importance is the information on breeding techniques and health care that is exchanged among zoos because of SSP.

The snow leopard master plan is in its first year of implementation. It calls for maintaining an effective population size of at least 200 cats in captivity.

So far zoos have been quite willing to cooperate with the snow leopard plan. Although there is a high cost for shipping animals to other zoos, this doesn't stop zoos from participating in the exchanges. What will be more difficult for zoos to deal with, says Freeman, is the request for a zoo not to breed certain individuals. Baby animals are a powerful draw for zoo visitors and provide zoos with good public relations. Nonetheless, Freeman states that, because zoos have the welfare of their animals at stake, they may be willing to make those kinds of sacrifices for the benefit of the snow leopard.

Freeman hopes that the master plan will eventually be expanded to include foreign zoos as well. Although this phase is not yet in place, U.S. and European zoos are presently exchanging animals with Moscow zoos upon request of the U.S.S.R. The Soviets will receive females to transform their all-male collection into a breeding colony. The male cats that Western zoos receive will add new blood lines to existing populations. Breeders

hope, among other things, that the language barrier won't be a deterrent to the new mating pairs!

Lincoln Park Zoo

For Mark Rosenthal, Curator of Mammals at the Lincoln Park Zoo, the only cliffs he will have to scale in his efforts to save snow leopards will be the artificial ledges being constructed in their soon-to-be-renovated Cat House. Rosenthal is a member of the snow leopard SSP Propagation Group. He reports that Lincoln Park has been one of the leading zoos in snow leopard captive breeding.

Lincoln Park received its first pair of snow leopards in 1913 and had been loaning out their animals for breeding even before the SSP master plan was implemented. Their leopards have traveled to San Francisco, Seattle, Philadelphia, Houston and Racine. One cat is even an overseas traveler, on loan to a zoo in Japan.

Before they began lending out cats, Lincoln Park had 14 snow leopards. During renovation of the Cat House, the zoo is finding temporary homes for all of their cats. In their new exhibits they will devote five indoor and five outdoor enclosures to the snow leopards.

According to Rosenthal, Lincoln Park has a strong commitment to

successful captive breeding programs. For the species they have targeted, the zoo devotes two to three full exhibits to each species. Rosenthal refers to this as "depth in the collection." Such large collections do not eliminate the need for bringing in new animals for breeding. What such "depth" does provide, however, is a safeguard against the possibility of an individual failing to breed in any given year. It also allows Lincoln Park to loan out individuals while maintaining other animals for their exhibits.

Rosenthal believes that the long range planning that the Lincoln Park Zoo and other zoos participating in the SSP are adopting is crucial for endangered species survival. "Zoos have to play the breeding games like good pool players — always looking three shots ahead instead of concentrating only on the next shot." And luckily for the snow leopard, the SSP promises to be the best play for successful breeding in captivity.

Mark Rosenthal is also Studbook Keeper for Spectacled Bears. His article on this endangered South American bear will appear in a future *Reprint* issue.

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photo by Margot Kuhn, courtesy Kings Island

Putting its coat to good use, this snow leopard relaxes in Ohio's winter snow.

Special Reprint Issue on Snow Leopards continued. . .

International Snow Leopard Trust

Befitting its rise to notoriety, the snow leopard even has its own Trust — the International Snow Leopard Trust. Helen Freeman of the Woodland Park Zoo and others involved in snow leopard research founded the Trust in 1981 for the purposes of research and education.

Specifically, the Trust is concerned with:

(1) providing a mechanism for the exchange of information on mountain species, particularly the snow leopard;

(2) informing and educating the public on the endangered status of the snow leopard and the importance of its interrelationship with other mountain species;

(3) promoting behavioral, physiological, cultural, and ecological research on high altitude flora and fauna;

(4) promoting the conservation and eventual restocking of the snow leopard in its native habitat.

The Trust is also actively supporting the International Snow Leopard Symposium, held every other year for the past eight years, which brings together delegates from North America, Europe and Asia to discuss snow leopard research and conservation.

Current programs of the International Snow Leopard Trust include sponsorship of an education program on mountain wildlife for school children in Nepal, support for research on snow leopard behavior and ecology, and plans to present preliminary results of fieldwork on the snow leopard in Nepal.

The Trust currently has a diverse membership of around 200 people and they publish a newsletter, *Snowline*. For more information, write to:

International Snow Leopard Trust
16463 S.E. 35th St.
Bellevue, WA 98008



The Kings Island Wild Animal Habitat exhibits a breeding pair of snow leopards.

photos by Margot Kuhn, courtesy of Kings Island

Kathleen Rude is the Associate Editor of the *Endangered Species Technical Bulletin Reprint*. She is a graduate student in the School of Natural Resources, focusing her studies on communications and wildlife.

Patuxent Whoopers Hit by Virus

Update by Todd Buchta

Seven whooping cranes have died of Eastern equine encephalitis at the Patuxent Wildlife Research Center, cutting the Center's captive flock of the endangered birds down to 32.

The deaths came when the whooping cranes received a virus causing encephalitis from the *Culiseta melanura* mosquito. The cranes died between mid-September and early November. Most of the birds were five years old or younger. Only one, a 16-year-old female, had produced offspring.

The loss of the cranes was a surprise, since Eastern equine encephalitis has never before been documented as a cause of death among "whoopers". The diagnosis came after collaboration between several government and academic wildlife health facilities.

"Even with all the intensive research done on whooping cranes in the last 15-20 years, it shows there's still a lot we don't know," said David Klinger, an official of the U.S. Fish and Wildlife Service, who runs the Patuxent facility.

The surprise was an unwelcome one. "As with any endangered species, the loss of even one individual is a blow to the recovery of the overall population," said Robert Jantzen, director of the Fish and Wildlife Service. "Mortality does occur, however, in captivity as well as in the wild."

Klinger noted that the sandhill cranes, a more common bird at Patuxent, remained untouched. "The mosquitoes zeroed in on the whoopers. They picked the most prized possession," he said.

Officials feel confident the current danger is passed, since the virus was found not to be contagious. Also, they believe the coming of cold weather has killed any mosquitoes left this season. To prevent further attacks next season, Patuxent officials expect to repeat intensive surveys for *Culiseta melanura*. The 4700-acre facility was surveyed once this fall, but no likely habitat for this species was found. The insect breeds primarily in dark, swampy bottomland beneath tree roots

where water accumulates. However, a second survey did find such habitat, and mosquito larvae were killed there.

Aside from the Patuxent flock, there are only approximately 125 to 128 "whoopers" left. About ninety make up a wild flock that migrates from Canada's Wood Buffalo Park to Aransas National Wildlife Refuge in Texas. There are also 35 to 38 cranes in an experimental wild flock that migrates from Grays Lake National Wildlife Refuge in Idaho to Bosque del Apache National Wildlife Refuge in New Mexico.

The latter flock was established partly by eggs produced by the Patuxent birds and hatched and reared by wild "foster-parent" sandhill cranes. The whooping crane's restoration is a joint effort of the U.S. and Canada.

Todd Buchta is a graduate student in the School of Natural Resources. He is completing a degree in environmental communications.

Looking Back at 1984

Forty-six more native and foreign animals and plants, ranging from China's giant panda to the diminutive bumblebee bat, thought to be the world's smallest bat, were added to the U.S. List of Endangered and Threatened Species during 1984. Among United States species, the Wyoming toad, the woodstork, and the woodland caribou are all now protected by the Endangered Species Act.

With these additions, the number of endangered and threatened species on the list now stands at 828, of which 331 species are found in the United States and 497 are found solely in other countries. The grand total includes 297 mammals, 220 birds, 99 reptiles, 85 plants, 62 fishes, 24 clams, 16 amphibians, 12 insects, nine snails, and four crustaceans.

In addition to the new listings, 54 other species were proposed in 1984 for listing as endangered or threatened. Among these are the wide-ranging interior least tern and piping plover, plants as exotic-sounding as the Last Chance townsendia and the large-flowered fiddleneck, and the Perdido Key beach mouse, believed to be the Nation's most critically endangered small mammal.

The year provided good news for several species that appear headed toward eventual recovery. The Arctic peregrine falcon and the Utah prairie dog were moved from "endangered" to "threatened" listings — reflecting an improvement in their status. The tiny snail darter — a southern Appalachian member of the perch family that sparked the most celebrated court test of the Endangered Species

Act — was likewise reclassified to "threatened," due in large part to the discovery of small numbers of the fish in additional locations. Other species on their way to a more secure future include the southeastern population of the brown pelican, whose removal from the endangered list has been proposed, and the Florida population of the American alligator, whose numbers have increased sufficiently that limited harvests of the reptile may be permitted, similar to those already held in Texas and Louisiana.

The Endangered Species Act entered its second decade in 1984. It is considered the world's foremost law protecting species faced with extinction. Among its major features are penalties for

1984 continued. . .

harming endangered animals, obligations placed on Federal agencies and projects under Federal license or sponsorship to protect endangered species, and the listing of threatened and endangered species eligible for protection under the act.

"The addition of any new species to the endangered species list is no cause for celebration," says Jantzen, director of the U.S. Fish and Wildlife Service. "But such listings enable us to extend legal protections to these species

and focus national and international attention on their plight. Our goal is eventual removal of all species from the list as recovery efforts for each of them are successfully concluded."

Listing is only the first step toward bringing a species back from the brink of extinction. Using the goals established by recovery plans for formally designated endangered species, biologists, conservation organizations, and State and Federal natural resource managers attempt to improve a

species' status through research, habitat protection, increased law enforcement, improved land management practices, captive breeding, relocations, and establishment of experimental populations. There are now 164 approved recovery plans for endangered and threatened species — an increase of 54 plans over 1983.

Last in the Series of Arguments for Plant Conservation:

4. Threatened species

Around 1970 Ronald Melville predicted that 20,000 different plant species were in some degree of danger. Most recent estimates are around 25,000, and possibly very many more which could be useful in the future, but whose potential is still to be discovered.

On 24 November 1983 the IUCN computer held records on 14,120 individual threatened plants. Of these:

- 326 were Extinct in the wild;
- 2171 were in imminent danger of extinction (Endangered);
- 2357 will soon become Endangered if nothing is done (Vulnerable);
- 4606 had small but stable populations and are at risk (Rare);
- 4660 were either Extinct, Endangered, Vulnerable or Rare but uncertain which (termed Indeterminate).

However, most of the species listed are from temperate and subtropical countries and from islands. There is no information for most tropical countries, most acutely for those with

tropical rain forests. There are several reasons for this: the very scattered distribution patterns of many species, the sheer numbers of species involved, and the lack of resources world-wide for tropical botany: most botanists live and work in temperate countries, whereas most plants grow in the tropics!

Therefore the figures cover only part of the flora likely to become extinct. It may be that 20,000 plants are threatened without including tropical rain forests, by common consent the habitat in which most plants are likely to disappear.

The lack of knowledge about plants and their populations is also true of tropical drylands. In many regions desertification threatens tree resources and centres of endemism such as in Somalia, where numerous succulent *Euphorbia* species and possible new crops such as *Yeheb Cordeauxia edulis* are in danger of extinction.

Drylands often abut regions with Mediterranean-type climates, which are very rich in species, many endangered.

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Threatened Plants continued. . .

Examples are the Mediterranean basin itself and the California chaparral. Probably most threatened of all is the Fynbos, the heath and protea vegetation of the Cape of South Africa. It is now reduced to 1.8m ha, an area smaller than the Kruger National Park and is mostly in small and vulnerable patches and narrow corridors.

The most acutely endangered species are on islands, especially those in the tropics and subtropics. The many endemics have often evolved in the absence of grazing animals and so are especially prone to introduced animals. Also, on most islands, pressures on land are intense and only small patches of relict vegetation remain. This is true of Mauritius, St. Helena, Norfolk Island, to name but a few, and perhaps most acutely, of Rodrigues, a dependency of Mauritius: here all but 2 of the 34 endemic plants are Extinct or Endangered.

During the last ten years there has been a tremendous effort to find out which plants in the world were threatened. In 1970 only Belgium had produced a threatened plant list. Today almost all countries of the 'North' (including South Africa, Australia and New Zealand) have produced Red Data Books listing their threatened flora. The one exception is Japan. Almost all use IUCN Red Data Book categories for assessing the degree of threat, allowing world and regional comparisons to be made. The one exception here is the United States. Of tropical countries, only India, by a herculean effort, has produced a list that covered more than example species, although IUCN has prepared moderately comprehensive lists for Central America (to be available soon).

On the international level, 'The IUCN Plant Red Data Book' gives 250 examples of threatened plants from around the world, with a brief analysis of the threats to them. It includes some of the world's rarest plants, those reduced to a single individual, like the dioecious and hence doomed ebony on Mauritius; it also includes some of the very few threatened plants which have actually been saved: the Eastern Island toromiro (*Sophora toromiro*), the Dove's Beak (*Lotus berthelotii*), the Castle Hill Buttercup (*Ranunculus crithmifolius ssp. paucifolius*) and the Marsh Rose (*Orothamnus zeyheri*) are the best known examples.

Ten years, too, have given time for reflection on the concept of threatened species. While an entirely legitimate, indeed praiseworthy approach, it simply does not work in much of the humid tropics. Here it will not be possible to determine which species are Endangered until they are long Extinct. A better approach is a broader concept, of what one might term 'plants of conservation concern', which can give proper emphasis to plants used by people.

Islands with among the most recorded threatened plants

	Ex	E	V	R	I	Total of endemics
Hawaiian Is.	62	822	45	65	784	1807
Canary Is.	1	64	124	121	9	514
Mauritius	19	65	35	39	14	222
Socotra	1	84	17	29	1	215
Juan Fernandez	1	52	32	9	1	118
Reunion	2	13	8	18	7	102

Ex: Extinction; E: Endangered; V: Vulnerable;
R: Rare; I: Indeterminate.

Yet the fact that one cannot identify threatened plants in many tropical moist forests is no reason to abandon the concept. In the views of all but a handful of people, it is right to prevent species becoming extinct, whether for moral, aesthetic or economic reasons. The very finality of a species' extinction, like the burning of a work of art, almost makes the detailed arguments appear unnecessary through appeal to the heart rather than the head. Surely the wisest course is to use all the arguments, including the emotional ones. After all, it is love of plants that usually brings people to botany.

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