1. Executive Summary: No more than 750 words. Please describe the original goals and the final results of your project. This may be used in press releases and other publicity material about the Grants Program, so please write it for the general public who may not have scientific background.

China has the largest amount of potential snow leopard (*Uncia uncia*) habitat and the most snow leopards. However, in many areas of China the status of snow leopards has still not been well investigated, and this is true for Yunnan province. Northwest Yunnan is at the edge of the snow leopard range, and there is much potential snow leopard habitat in the Three Parallel Rivers world heritage site. At this site the Yangtze, Mekong and Salween rivers cut deep valleys through the Hengduan Mountains of the eastern Himalayas producing much potential snow leopard habitat. Snow leopards have been reported from the Meilixueshan Reserve between the Mekong and Salween rivers, but in most areas of northwest Yunnan snow leopard status is unknown. Our goals were to first document the presence of snow leopards and important prey items such as blue sheep (*Pseudois nayaur*), Chinese goral (*Naemorhedus griseus*) and alpine musk deer (*Moschus chrysogaster*) with camera trapping at three study sites: (1) the Baimaxxuehan Nature Reserve between the Yangtze and Mekong rivers (2) near Guji village, an area outside of Baimaxueshan also between the Yangtze and Mekong rivers and (3) near Langdu village east of the Yangtze River. We also planned to estimate the population size for prey items and the number of snow leopards in each area and assess the level of human-wildlife conflict from snow leopard predation and threat of snow leopard poaching by interviewing herders at each study site.

In the north of Baimaxuehan Reserve we deployed 9 camera traps from this proposal at 27 unique locations from December 2012 - April 2014; near Guji we set 4 traps from September 2013-April 2014, and near Langdu we had 6 camera traps at 6 unique locations from June-December 2013. We also deployed 6 traps belonging to the Baimaxueshan reserve in 11 unique locations.

There have been no pictures of snow leopards yet, but we obtained a picture that is likely to be a common leopard (*Panthera pardus*) at 4,106 m elevation in Baimaxueshan. Common leopards have been reported at elevations up to 5,000m, and two hunters from the nearby village of Yeri have killed several common leopards over 20 years ago at Baimaxueshan, and both of them still have skins from the leopards. In the north part of Baimaxueshan we also collected a potential snow or common leopard scat, and in the same area we found the skulls of three blue sheep rams at 4300m elevation. The rams
appeared to be in the prime of their lives and were likely killed by carnivores. More research is necessary to determine the species identity of the scat as well as potential snow leopard and common leopard overlap.

Herders claimed that snow leopards were present at all study sites but they were not implicated in any livestock killings. There was, thus, no human-wildlife conflict between the herders and snow leopards, and no evidence of snow leopard poaching. It seems that if snow leopards are present at the study sites they are at low densities. There is much potential snow leopard habitat, however, for range expansion. For example, we found large numbers of blue sheep the primary prey for snow leopards in both study areas as well as large numbers of alpine musk deer at Langdu and goral at Baimaxueshan.

There is currently intensive copper mining near Langdu, and this has potentially disturbed snow leopards. It would be useful to investigate other areas of Baimaxueshan, and we also heard reports of snow leopards from other areas of northwest Yunnan such as Balagezong Nature Reserve, which should also be investigated in the future.

2. Objectives: What was the purpose of the project? How was it expected to contribute to the knowledge or conservation of snow leopards, their prey, or habitat?

We had the following three objectives:

1) Document the presence of snow leopards and prey items such as blue sheep and alpine musk deer at the three study sites in northwest Yunnan

2) Estimate the population size for prey items and the number of snow leopards in each area.

3) Assess the level of human-wildlife conflict from snow leopard predation and threat of snow leopard poaching in each area.

3. Methods: Describe the methods you used in detail, so that someone else could repeat the work, or, avoid the problems that you encountered.

To meet the objectives Paul Buzzard of the Detroit Zoological Society and Li Xueyou of the Kunming Institute of Zoology, used camera trapping and interviews from December 2012-April 2014. Much of the previous research on snow leopards and other big cats set the traps in pairs to identify individuals (e.g.
Silver et al. 2004). For this initial assessment, we did not set the traps in paired arrangements so as to cover more territory. In the north of Baimaxueshan Nature Reserve near Yeri village we set nine camera traps (Bushnell Trophy CamTM) from December 2012-May 2013 at 3,988-4,532m in potential snow leopard habitat. Then from June - October 2013 we reset eight of these traps at 2641-3033m elevation. From October 2013 – April 2014 we set 9 camera traps as well as 6 traps belonging to the Reserve. From September 2013 – April 2014 we set four additional traps from this proposal in potential snow leopard habitat to the west of Baimaxueshan near the China Exploration and Research Society Tibetan mastiff kennel (www.cers.org.hk) at Guji village (~N28º 27' E98º 57’, 4709-4986 m). At Langdu we set six camera traps from June-December 2013 at 4579-4815m elevation.

In many cases we were able to directly count blue sheep herds to estimate the population size of blue sheep at Baimaxueshan reserve. We also estimated the density of blue sheep and other potential prey items at Baimaxueshan by conducting dung transects and assessing fecal accumulation after 4 day intervals.

We also interviewed local herders at each study site to assess human-wildlife conflict from snow leopard predation of livestock as well as snow leopard poaching. At Baimaxueshan there is a compensation program to reimburse herders for livestock losses because of predation (Li et al 2013). The interviews determined how much predation can be attributed to snow leopards. We interviewed to see if the herders knew of any instances of snow leopard predation in the area or have seen snow leopard skins used in local Tibetan formal clothing.

4. Results: Please describe in detail the results of your project. Please illustrate clearly how your stated goals and objectives could be met. You may wish to include tables or graphs in this section if appropriate. This section will be very important to explain the value of these grants to funders of the Snow Leopard Conservation Grant Program. Please be clear, concise, and thorough.

1) Baimaxueshan Nature Reserve

In the northern area of Baimaxueshan Nature Reserve we set 9 camera traps from December 2012-May 2013 at elevations 3988-4532m for a total of 1054 camera trap days. We captured photographs of potential snow leopard prey including 104 pictures of blue sheep and 2 pictures of goral. We also captured pictures of other carnivores including 2 black bears (Ursus thibetana), 1 wolf (Canis lupus), 10 red fox (Vulpes vulpes) and 1 Yellow-throated marten (Martes
flavigula). From June-October 2013 we reset the traps in 8 unique locations from 2641-3033m elevation for 730 camera trap days. We captured 262 goral, 356 blue sheep as well as 2 black bears, 1 masked palm civet (Paguma larvata) and 1 Leopard cat (Prionailurus bengalensis). From October 2013 – April 2014 we set 15 camera traps (including 6 belonging to the Baimaxueshan Nature Reserve Management) in unique locations at elevations from 2939-4613 m for a total of 2108 camera trap days. We captured a picture of what is likely a common leopard (Panthera pardus, Fig. 1) as judged from the number and size of rosettes. We also captured photographs of potential prey including 2 pictures of blue sheep, 10 pictures of alpine musk deer, 5 pictures of tufted deer, 3 pictures of at least 3 individual serow, 6 pictures of unknown deer, 1 picture of wild boar and 7 pictures of at least 2 wooly hare (Lepus oiiostolus). We also captured 2 pictures of white-eared pheasants including at least 2 individuals. We also obtained pictures of other carnivores such as 1 feral dog (Canis domesticus), 1 likely Tibetan fox (V. ferrilata), and 1 Yellow-throated marten. These traps were reset at elevations of 4812-5077 m and will be collected in October 2014.
We found potential common leopard or snow leopard scat (Fig. 2). Hopefully, in the future genetic work can reveal the species identity of the scat. We also found the skulls and skeletons of 3 Blue sheep rams at ~4300m altitude. These rams were in the prime of life and likely killed by predators such as snow leopards.

The large amount of potential prey indicates that there is much potential snow leopard habitat for range expansion. For example, we found large numbers of blue sheep, the primary prey for snow leopards, in both study areas as well as large numbers of alpine musk deer at Langdu and goral at Baimaxueshan. Direct counts showed there were at least 9 large groups of blue sheep at Baimaxueshan. The largest group was recorded at Quzonggong (4200-5210 m asl.) with 126 blue sheep individuals. The population size of the other blue sheep groups were range from 31-64 individuals. The total population size of blue sheep counted during transect surveys was 469 individuals. Wild ungulates which could be prey of snow leopard and other large carnivores at Yeri were numerous. Using fecal accumulation rate (FAR) on the transects, the population average density of alpine musk deer at Baimaxueshan was considerable, as high
as 10.8 individuals per km$^2$. The goral density was also sizable, estimated to be 4.1 individuals per km$^2$.

At Yeri village in the northern area of Baimaxueshan the interviews indicated snow leopard presence but no snow leopard predation of livestock and no evidence of snow leopard poaching. There had been common leopard poaching, however, and two hunters had killed several common leopards over 20 years ago at Baimaxueshan; both hunters kept skins for souvenirs (Figs. 3, 4).
Fig. 3. Skin of a common leopard killed near Yeri village, Baimaxuehan Nature Reserve, Yunnan China. (measurements: body length: 117 cm, tail length: 63 cm).
Fig. 4. Another skin of a common leopard killed near Yeri village, Baimaxuehan Nature Reserve, Yunnan China (measurements: body length: 106 cm, tail length: 66 cm).

2) Guji
We set 4 traps from September 2013- April 2014 adjacent to Baimaxueshan near the CERS Tibetan mastiff kennel at Guji. One trap malfunctioned so it cannot be precisely determined how long it was set for so; the other traps were set for at least 597 camera trap days. We obtained 2 independent pictures of blue sheep including at least 3 individuals, 4 pictures of Tibetan snow cock including at least 3 individuals and one unknown small carnivore.

Herders mentioned snow leopards in interviews but no human-wildlife conflict.

3) Langdu

Near Langdu village we set 6 camera traps at elevations of 4579-4815m from June-December 2013 for 822.3 camera trap days. We captured 14 independent pictures of blue sheep and a total of at least 40 individuals. We also obtained 9 independent pictures of at least 9 alpine musk deer, 2 unidentified game birds, 1 Himalayan marmot (*Marmota himalayana*) and a leopard cat.

Herders mentioned snow leopards in interviews but no human-wildlife conflict.

3) Other areas

We heard reports of snow leopards at the Balagezong Nature Reserve south of the Baimaxueshan Reserve between the Yantgae and Mekong Rivers.

5. Discussion: Please evaluate your own work. What did you learn that could help others wishing to do similar projects? How do you see the results being applied to conservation? What additional work is now needed based on your findings?

We did not obtain any pictures of snow leopards yet but we did obtain the likely picture of a common leopard. We judged that it was common leopard based on the large number and small size of rosettes. In addition, a herder from nearby had the skin from a common leopard that he had killed over 20 years ago. Interviews with herders indicate that snow leopards are present or recently were present but there were no indications of human wildlife conflict with snow leopards. We found much potential prey for snow leopards but snow leopard sign was rare so if snow leopards exist at the study sites it likely they are rare. Potential niche expansion of common leopards into higher altitude and overlap with snow leopards should be further investigated.

The potential prey for snow leopard and other large carnivores were abundant in northwest Yunnan. We obtained many pictures of potential snow leopard prey such as blue sheep, goral and alpine musk deer, and their densities estimated by
FAR were substantial. Counting fecal groups for density estimate is a time-consuming method, and the precision of the results is made difficult by estimations of dung deposition and the different decay rates of dung in various habitats. Thus, it is necessary to explore and develop other possibilities for determining the densities of alpine ungulates such as using camera trap models using ranging parameters as done by Rowcliffe et al. (2008).

Northwest Yunnan is the edge of snow leopard distribution but if snow leopard populations rise in other areas there is much potential snow leopard habitat in northwest Yunnan given the large numbers of prey populations. Near Langdu there has been a recent expansion of copper mining and this has possibly disturbed snow leopard populations there. Efforts should be made in the future to limit mining in potential snow leopard habitat.

It would be useful to survey other areas of the northern Baimaxueahan Reserve as well as the Balagezong Nature Reserve where we heard credible reports of snow leopards.

6. Photographs: If you have good photographic (preferably digital) images of your project that we could use to advertise the Grants Program, please submit them at this time. Please be sure to include a brief description of the photo and provide the credits for the photographer.
Fig. 5 Goral in the northern part of the Baimaxueshan Reserve
Fig. 6. Herd of blue sheep by Langdu village and above Meixiang yak cheese factory, NW Yunnan
Fig. 7 Alpine musk deer near Langdu and Meixiang, NW Yunnan