South China Tiger Prey Habitat Suitability Assessment in Hupingshan-Houhe National Nature Reserve Complex, China

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April, 2010

ABSTRACT
A habitat suitability assessment of prey species of south China tiger in Hupingshan-Houhe National Nature Reserve Complex was carried out using a Geographical Information System. Wild boar was selected as a model species. Information on the habitat requirements and natural history characteristics of wild boar was synthesized from published literature. A preliminary Prey Habitat Suitability Index model was derived based on criteria that fulfill the species’ requirement and reduce human-wildlife conflict. The study identified parts of the NNR likely more suitable for wild boar. However, further study on wild boar habitat requirement is needed.

INTRODUCTION
The South China Tiger (Panthera tigris amoyensis) is a critically endangered tiger subspecies native to China. Wild south China tigers are likely ecologically extinct.1 Once numbering more than 4,000 in the wild, the tiger population in China suffered dramatic declines due to government eradication, habitat loss, unregulated hunting, and relocations of residents.2

To restore wild tigers in China, Chinese authorities and international organizations are seeking to identify one or more existing protected areas in the south China tiger’s historical range possibly large enough to support wild tiger populations.2 Based on evaluations of key landscape, habitat, and slope characteristics, Hupingshan-Houhe (HH) National Natural Reserve (NNR) Complex was identified as one of the two sites possibly suitable to support a small population of wild tigers.

To successfully reintroduce and restore the tiger, certain habitat and landscape requirements of the species must be satisfied.3 According to Sunquist, tiger and prey densities are highly positively correlated.4 Important tiger prey include forest or grassland ungulates, ranging from small deer and pigs (30 – 40 kg) to large animals like Sambar and buffalo (160 – 400 kg).5 In southern China, lack of suitable prey is a fundamental problem to tiger reintroduction. A major unanswered question is what and how many species could survive in this area. According to Smith and Xie, at least thirteen possible tiger prey species may have lived in this region historically.6 In this study, we use Wild Boar (Sus scrofa) as a model species for a prey habitat suitability assessment of HH NNR.

METHODS
We synthesized relevant information on wild boar habitat requirements and biology from available literature. A preliminary Prey Habitat Suitability Index (PHSI) model was built based on criteria that fulfill the species’ requirement and reduce human-wildlife conflict. The model uses the following formula: PHSI = H + Ev + Sip + Asp + DW + DE + DA + DR. The parameters and values are summarized in Table 1.

All GIS data were provided by Philip J. Nyhus, based on previous Colby student research.9 All layers were clipped to display only the HH NNR area. Agriculture and forest were extracted by attribute from landcover data. Forest edges (deciduous forest - shrub/grassland and evergreen forest - shrub/grassland) were derived using focal statistics by calculating the range between values. The distances to rivers, roads, forest edges, and agriculture were obtained by Euclidean distance. All parameters were reclassified on a scale from 0 – 10. PHSI values were first calculated by weighted sum of all reclassified parameters with equal weight. The PHSI values were normalized using the following formula:

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\text{PHSI} = \frac{\sum \text{weights} \times \text{values}}{\sum \text{weights}}
\]

**REFERENCE**

Massei, D., Tilson, R. Personal data collection, Environmental Studies Department, Colby College, Waterville, ME, 2005.

**RESULTS**
Figure 1 and Figure 2 display the parameters of the PHSI model in HH NNR. Figure 3 shows the result of a preliminary habitat assessment for wild boar based on a scale from 0 – 1, where a higher value indicates higher habitat suitability. The mean PHSI value was 0.577 ± 0.115. In our preliminary PHSI model, approximately 70% of the area resulted in a relative value of 0.5 or higher. The area and percentage of each PHSI value class are summarized in Table 2.

**DISCUSSION AND CONCLUSION**
The model is based on the natural, topographical, and human influence of HH NNR. The amount of suitable habitat is mostly constrained by high elevation and steep slopes that are not favored by wild boar. In addition, human activities in the park have considerable influence as well. For example, agricultural fields may cause potential wildfires that may reduce wild boar’s habitat. The road network in the park often follows along the water ways that increases the opportunity of collision by vehicles.

With limited data and information on the habitat needs of wild boar in this area, our preliminary model is rudimentary. The study would benefit from the following: (1) Reclassification, assigned weight, and model building requires further refinements. (2) Seasonality of the habitat and the behavior of wild boar should be taken into consideration. Some studies are conducted on habitat selection and behavior.6, 8 (3) Other parameters assessed in other studies have shown significance in wild boar habitat selection, such as snow depth, winter temperature, and human population.4 (4) Wild boar population dynamics (e.g., population density, growth rate, home range, and social structure) should be integrated. It should also be noted that the information obtained from literatures is limited as the environment of the study areas varies, which can profoundly influence the habitat selection and wild boar behavior.

Further study on the habitat requirement of wild boar and field data on the species distribution using radio telemetry are needed to develop a more refined model. Also, a complementary study of the ecological and socioeconomic aspect of prey reintroduction, conservation, and human-wildlife conflict should be considered before launching a tiger reintroduction program.