

VEGETATION CONSERVATION USING A 3-D GIS AT YANGMINGSHAN NATIONAL PARK

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ABSTRACT:

Yangmingshan National Park is one of the four national parks in Taiwan. Conservation is one of the four management goals. Vegetative rare species in the park have been investigated and identified. This paper discusses vegetation conservation using a 3-D GIS. The whole process is configured so that any one, familiar with personal computer or not, can implement it to solve problems relevant with vegetation conservation right away. Solid modeling, maps, images, color slides and attributes can be extracted from a 3-D data base without touching a computer keyboard. The whole process can be implemented to solve other problems as well.

KEY WORDS: Vegetation conservation, 3-D GIS.

1. INTRODUCTION

Yangmingshan National Park is one of the four national parks in Taiwan. Conservation, recreation, research, and education are its four management goals. It covers an area about 10,000 hectares. It locates next to the capital. Traffic jam is not unusual in weekend, even worse in the blossoming season. Vegetation conservation has to solve visitor impacts efficiently.

Vegetation population investigation of rare species at the park has been performed (Hsieh, et al. 1990). One species has been identified as endangered. Two species were categorized as vulnerable; six for rare; three for insufficiently known; and nine for non-endemic. Conservation management prescription for every rare species was also provided.

A self-developed 3-D GIS (Wu, et al. 1989) was available for the management of the park. This paper will discuss how conservation of the 21 rare species can be facilitated by the 3-D GIS.

2. METHOD

Distribution of the 21 rare species were delineated on the topographic maps, both on a single park map and 27 sheets of orthophoto maps at a scale of 1:5,000. For a single rare species, all spatial information of the existing data base can be overlaid to it. Color slides of all rare species were scanned and stored as image files in a TARGA file format. Species characteristics, site description, and management prescription were stored in a personal computer with three types of file format involving text, data base, and image.

Solid modeling of the distribution of every species was performed by a commercial animation package and stored

sheet by sheet at a scale of 1:5,000. All solid models are stored as image files.

An automatic inquiry system was developed to display all stored information on a single rare species basis or by its endangered condition classifications. It is written with AutoLisp language. Some programs written in C also used to extract attributes associated with a single species. It is a computer-aided design package (CAD) with image overlay capabilities that all inquiries were performed. One Color monitor and a TARGA display card are required.

3. RESULTS AND DISCUSSION

3.1 Results

Figure 1 is the first menu shown on a color monitor. Moving a mouse and clicking it at 1 or 2, one can get rare species by its endangered condition classification or by a single species. Figure 2 shows the second menu if No. 1 has been chosen on Figure 1. There are eight groups on Figure 2. If the endangered has been clicked, then Figure 3 will show. Figure 3 is a typical menu for a specific species. Description, site, management prescription, solid models of its distribution, color slides, and distribution map are all available. Figure 4 shows the two vulnerable species. Either one is clicked then a specific species will show up, which is similar to Figure 3.

If one clicked the second one, by species, then Figure 5 will show on a color monitor. There are 21 species available for further analysis. It is the distribution map that can be overlaid with other data layers such as, contour, slopes, river, road, geological map, and zoning map.

3.2 Discussion

Any new items can be added to Figures 1 to 5. But it is not easy for a technician who is not familiar with AutoLisp. The more items on a single menu, the slower the computer

will response. It is user friendly that any one can implement it to solve problems relevant with vegetation conservation right away. Figures 1 to 5 can be changed into Chinese very quickly. Although all commands were written in English, the vegetation conservation practice

can be implemented in a Chinese environment. Research and development, technology distribution, and supply of data are three categories that support GIS technology (Parker, 1991). Vegetation conservation can be facilitated by the three types of business as well.

Vegetation Conservation for Rare Species at Yangmingshan National Park	
1. By Endangered Condition Classification	
2. By Species	

Figure 1. The first menu.

Rare Species by Endangered Condition Classification			
Extinct	Endangered	Vulnerable	Rare
Indeterminate	Insufficiently Known	Out of Danger	Non-endemic

Figure 2. Rare species by endangered condition classification.

Endangered: <i>Isoetes taiwanensis</i> Devol		
Description	Site	Management Prescription
Solid Models of Its Distribution	Color Slides	Distribution Map

Figure 3. A menu for a single species.

Vulnerable Species:	
1. <i>Eriocaulon chishingsanensis</i> Chang	
2. <i>Rhododendron longiperulatum</i> Hayata	

Figure 4. The two vulnerable species.

Rare Species: By Species		
1. <i>Isoetes taiwanensis</i>	2. <i>Eriocaulon chishingsanensis</i>	3. <i>Rhododendron longiperulatum</i>
4. <i>Calanthe graciliflora</i>	5. <i>Deutzia cordatula</i>	6. <i>Hypericum formosanum</i>
7. <i>Maackia taiwanensis</i>	8. <i>Rhododendron nakaharai</i>	9. <i>Sedum sekiteiense</i>
10. <i>Akebia</i> sp.	11. <i>Asarum taitonensis</i>	12. <i>Rhododendron pseudochrysanthum</i>
13. <i>Bretschneidera sinensis</i>	14. <i>Dendrobenthamia japonica</i>	15. <i>Drosera spathulata</i>
16. <i>Dysosma pleiantha</i>	17. <i>Eriocaulon sexangulare</i>	18. <i>Kadsura japonica</i>
19. <i>Ligularia japonica</i>	20. <i>Luzula multiflora</i>	21. <i>Stephanotis mucronata</i>

Figure 5. Rare species by a single species.

4. CONCLUSION

Vegetative rare species in the park have been investigated and identified. Management prescriptions made by those specialists can be implemented on a daily basis. All information is now integrated into the existing data base. It is a GIS that brings vegetation conservation into a very user friendly environment. All information relevant with all the 21 rare species can be extracted by mouse clicks. This process is also very useful to solve other management problems as well.

5. REFERENCES

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