The Vegetation History of the Bukit Timah Nature Reserve and Central Catchment Nature Reserve

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Abstract

Since the founding of modern Singapore by the British in 1819, it was estimated that 95% of the primeval vegetation was cleared for agriculture and/or development. Currently, some remnants of primeval vegetation can still be found in the Bukit Timah Nature Reserve (BTNR) and Central Catchment Nature Reserve (CCNR). These patches of primary vegetation are surrounded by secondary forests of different ages as well as freshwater swamp forest and open, non-forested areas. Some vegetation maps of the these two nature reserves have been produced. However, because new, high-resolution satellite imagery and map-making software, and boat access to previously inaccessible sites are now available, an update of the vegetation map of the BTNR and CCNR, is timely. Hence, the main objective of this study was to produce a current vegetation map of both using free satellite images from Google Earth. This aim was achieved. A map of the primeval vegetation of the study site was also composed. The quick and economical vegetation map-making method employed in this study using visual inspection for classifying vegetation types, which although has its subjectiveness, can significantly improve its accuracy with site-surveys and ground-truthing.

Introduction

The primeval Singapore Island was estimated by Corlett (1991) to be covered by freshwater swamp forest (5% of the area), lowland evergreen rainforest (82%), and mangrove forest (13%). Since of its founding by Stamford Raffles, Singapore has undergone rapid modernisation. Much land were cleared for agricultural purposes. It was in 1883 that, forest reserves were first established (Wee & Corlett 1986). Since then, the area of the forest reserves fluctuated. Bukit Timah is the only one that have persisted for long (Wee & Corlett 1986). Besides Bukit Timah, patches of primary forest can also be found surrounding the reservoir as they were protected too (Corlett 1992). Currently in Singapore, there are four nature reserves. Two of them, Bukit Timah Nature Reserve (BTNR) and Central Catchment Nature Reserve (CCNR) contain most of the non-coastal vegetation. The vegetation map of these two reserves have been published by several authors and the most recent one was published in Corlett (1997), which was 12 years ago. Hence the objectives of this study is to produced a vegetation map of these two reserves. The map would then be used to assessed the state of vegetation in the two reserves.

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2 Supervisor
Materials and methods

Satellite images of the BTNR and CCNR were obtained from Google Earth Pro [5.0.11337.1968 (beta)] and Google Earth [5.0.11337.1968 (beta)]. The image provider for these was Digital Globe. The images were made at these times: 16 October 2003, 29 January 2006, 19 February 2006 and 17 January 2008. occurred from 2003 to present, these images should provide reasonably accurate images of the vegetation which only changes over decades or centuries, if undisturbed. The latest available and cloud-free images were used for composing the map. Map was created using ESRI® 9.3 ArcMapTM component of the ESRI ArcGIS geographic information system software (ESRI, 2008).

The vegetation types were classified into types based on the visual inspection of satellite images, contour maps as well as previous work of Corlett (1997) and Turner (1996). The five types are non-forested area, young secondary forest, old secondary forest, primary forest and freshwater swamp forest.

Results and Discussions

The vegetation map composed is shown in Figure 1 and the summary of the areas of various vegetation types is shown in table 1.

This study would have underestimated area of the old secondary forest and primary lowland evergreen rainforest as this study adopted a more conservation approach. Intermediate between young secondary forest and old secondary forest have been classified as young secondary forest in this study. Moreover, sometimes it is hard to differentiate the various vegetation type by basing visual inspection of images. Hence, ground-truthing and site-surveyings are needed to improve the quality of this vegetation map. Nonetheless this serves as a quick estimation of the the quality of the forest.

By tracking the differences of this map and that of Corlett (1997), it was found out that most part of the forest remained unchanged. The slow successional rate would mostly like be attributed to the poor soil conditions as well as the lack of large seed dispersers. On the other hand, little forests were degraded within this 12 years. This is expected as the two areas of study are nature reserves protected. The area that shows changes is shown in Figure 2.

References

**Figure 1** Vegetation map of BTNR and CCNR.
Figure 2. Map showing the vegetation compositional differences between Corlett (1997) and the present-day vegetation map composed in this study.