



Watershed Land Cover Change Detection in Guam



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Land cover change (LCC) has been a subject of concern for the past century, particularly the past few decades around the world. Although many of the changes have been recorded qualitatively through the use of comparative photography and historical reports, little quantitative information has been available at the watershed scale. It is currently possible to detect land cover change and determine trends in ecological and hydrological condition at the watershed scale using advanced geo-spatial technologies. Satellite remote sensing, spatial statistics, geographic information systems (GIS), and global positioning system (GPS) can be used to identify LCC of watersheds. These technologies provide the basis for developing landscape composition and pattern indicators as sensitive measures of environmental change and thus, may provide an effective and economical method for evaluating watershed condition related to disturbance from human and natural stresses.

Landsat observations have evolved from an experimental system in the 1970s to a feasible system to ensure our ability to explore, characterize, monitor, manage, and understand changes in the Earth's surface. Land cover has been derived from a multi-date satellite imagery database which incorporates Landsat Multi-Spectral Scanner (MSS) imagery from the early 1970s to early 1990s, Landsat Thematic Mapper (TM) imagery from early 1980s to current, Landsat Enhanced Thematic Mapper Plus (ETM+) from early 1999 to current at local and/or regional scale. Recent surveys indicate that land cover/use changes have a direct and enormous effect on water quality and environmental change. Watershed water quality and ecosystem are threatened constantly by both human impacts like forest

fires and development and also natural phenomena like storms and droughts. In addition, the combined uses of GIS, remote sensing and GPS tools have been highlighted with respect to their advantages in watershed applications.

Spatial and temporal modeling of changes in wetlands and badlands in Southern Guam watersheds was identified as one of the highest priority research needs for Guam on the Guam Advisory Council meetings of November 15, 2004 and October 4, 2005. Four (4) temporal Landsat images from 1970s, 1980s, 1990s and 2005 (with about ten year's interval) were obtained to measure changes of watershed land cover over three decades in Guam. The 1978 topographic map of Guam and recent IKONOS imagery were used as auxiliary information sources to improve land cover classification accuracy. Ten (10) meter digital elevation model (DEM) data were used to delineate the watersheds in Guam. The study area focused on 14 watersheds in Southern Guam. The main objectives of this project were to:

- Search and obtain Landsat imagery for different dates
- Preprocess the images such as georeference, projection and georectification
- Conduct classification to extract land cover information from the satellite images
- Compare the spatial and temporal land cover information to detect changes
- Provide change detection maps

