I. INTRODUCTION

Forest conversion to other land uses can affect watershed functions in a number of ways. Land use changes at the 'source' or upland areas of watersheds have effects on the users of the water downstreams. Watersheds involve multiple users and decision-makers that are not affected equally by the introduction of watershed development technology (Susswein et al., 2001).

On the Decree of Republic of Indonesia No. 41/1999 on Forestry date 1 October 1999, Article 18, subsection 1: Government determine and maintain the sufficiency of extent of forest area and forest coverage for each watershed and or island, in order to optimize environmental, socio and economic benefits for local community. It is also mentioned in subsection 2: The minimal extent of forest area should be maintained in subsection 1 is 30% (thirty percent) of watershed area and or island with proporsional distribution.

II PROPOSED STUDY AREA

- The area lies between 2°10’ N to 2°56’ N and 98°26’ E to 99°15’ E
- The area of the catchment area is 369,854 ha
- Water surface area is 110,260 ha According to Forest Land Use Agreement (TGHK) the area of forest in catchment area are 140,625 ha. Protection forest is 104,625 ha and Limited Production Forest is 36,000 ha (Forestry Board of NS, 1998)
- The depth is in on average 450m and up to 900m in some places.
- The altitude is between 904 to 1,982 asl
- Slope percentage from 0 to 45% which 39% of the area is steep
- It comprises 5 regions: Toba Samosir 201,884 ha (77.77%), Tapanuli Utara 23,695 ha (9.13%), Simangulun 21,980 ha (8.47%), Dairi 6,455 ha (2.49%), and Tanah Karo 5,580 ha (2.15%)
- Average rainfall per year between 1,627.28 mm and 1,846.10 mm. Samosir Island has less, 1,413 mm/year with long period of dry season in May to September.
- Average temperature is between 18.45°C and 18.52°C.
- Functions as a natural dam, provides water supply to move electricity power station, irrigation water supply for paddy field in the surrounding area, potentially in tourism development in Sumatra Utara Province.
- There are 220 rivers empty into Lake Toba. Most of it are intermittent (has water in rainy season). The perennial (has water along the year) are 70 rivers. Rivers in Samosir all intermittent. Rivers which empty into Lake Toba are small river less than 10 m width.
The only river which the Lake Toba as water source is Asahan River, empty into Malaka Straits through Tanjung Balai with 157 km length. High accessibility: mainroad. 176 km from Medan

III PROBLEM IDENTIFICATION
Problems identified in the study area are:
1. Deforestation in some part of the area
2. There are unproductive areas
3. Decreasing of water level of the Lake
4. Soil type which are susceptible to erosion
5. Bad condition of rivers which drain into the lake
6. Physiography vary from flat to mountaneous

IV RESEARCH OBJECTIVES
General Objective:
To develop forest management plan in integrated watershed management for environmental, socio and economical benefits, particularly in the study area

Specific objectives to be achieved are:
1. To find out the land use change within the area in some period of time
2. To find out the pattern of change within the forest area
3. To develop forest management plan model in supporting watershed functions

V RESEARCH QUESTION
These are the research questions:
1. Are the land uses in accordance with the land suitability and land use policy?
2. Is there relationship between forest conversion with watershed function?
3. What kind of plan is needed for the forest area?

VI MATERIAL AND METHODS
1. MATERIAL
The research will involve certain types of data and information related to the study area. Remote sensing imagery will be used are within different time for a certain period of time.

1.1. Images
Images will be used here are Landsat TM/ETM+ and/or other images. The area are covered by.

1.2. Maps
Maps are also needed as basic data and for further analysis: Topography, Contour, Soil, Slope, Climatic, Forest Land Use, land system and land suitability and land status/Recommended Development Areas Maps.

1.3. Secondary data
Data and information related to the study area are also needed. These data are important for supporting the research progress.

1.4. Field Data
Data from the field are needed for the research. There will be valuable data and information, including verification of the existing data.

2. METHODES
The handling of spatial data usually involve processes of data acquisition, storage and maintenance, analysis and output. Typical planning projects require data
sources, both spatial and non-spatial from different institutes, like mapping agency, geological survey, soil survey, forest survey at the census bureau (de By, et al, 2001).

The research will have some steps to be done:
1. Literature study
2. Data entry and preparation
3. Ground Check
4. Spatial Data Analysis
5. Measure of Error
6. Data Visualization

Data entry and preparation are spatial data input, obtaining spatial data, spatial referencing, data check, transformation and filtering. Spatial data analysis are including classification, retrieval, classification and measurement, overlay, and analysis. Data visualization is needed for output. Measure of error is needed to find out the data quality.

Change detection will be done within some period of time in the study area by processing the images. By analyzing the change, the pattern of change will be identified, particularly within the forest area.

Forest condition; degree of degradation and intensity of rehabilitation will be indicated in the analysis. The final result of the research is a model of forest management plan. The plan is aimed to support watershed functions.

VII AVAILABILITY OF IMAGERY AND MAPS

Environmental Impact Control Board of NS in hard and soft copy.
In cooperation with Faculty of Geography – Gadjah Mada University
(The Study on Determination of Ecosystem Boundaries for NS, hydrology and landcover condition study)
LANDSAT TM/ETM+ AND SPOT 2000, 2001
Path-Row: 129-58 ; 128-58
MAPS: ecology, vegetation, climate, soil and slope

INTERNET INFORMATION
ASTER OCTOBER 2002 (128-58), cloud cover 39%
LANDSAT ETM+ FEB, JULY 2002 (0,50%)
  AGT,SEPT 1999 (9,25%)
  SEPT 2000 (100,69)
  OCT 2000(92,50)
  SEP 2001 (67,84)
LANDSAT TM JUNE 89 (0%)
  DEC 1990 (10,70)

PERSONAL
Landsat June 1999, 2000
Digital maps : land system, detail administration, Forest Land Use (TGHK), others scale 1 : 250.000
BAKOSURTANAL
Peta liputan lahan 1:250000

Landsat (archive) in Lapan for 50 USD.

The application of geoinformation in sustainable management of forest land
--- forest biomass assessment and modelling
--- management of trees resources outside the forest
--- forest land and climate change
--- watershed management and environmental protection
Gambar 2.1. Peta Penggunaan Kawasan di 11 CDK