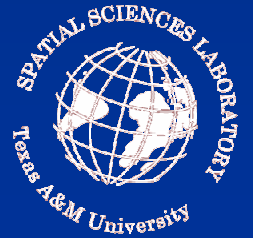
Application of SWAT in Developing Countries using Readily Available Data

J.H. Jacobs & R. Srinivasan



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The Tana River Basin

- **Disruption of wildlife habitat**
- **Increased soil erosion**
- **Disruption of hydrological cycles**
- **Lack of forest products**
- **Destabilization of local and global climate patterns**

Inadequate water for domestic use and irrigation

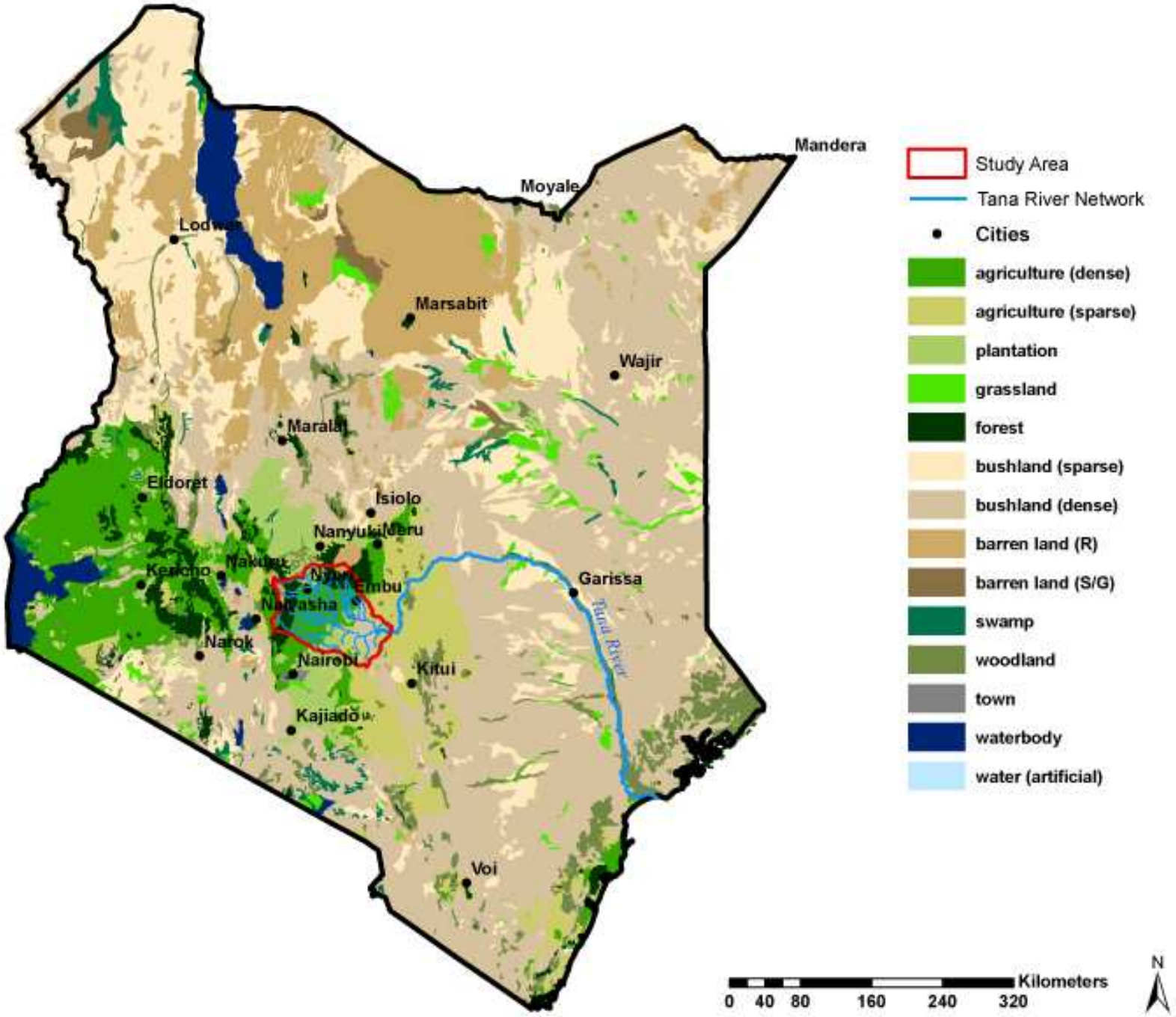
- **Nairobi Water supply**
- **Horticulture and irrigation schemes**

Siltation and water levels in the Masinga Dam

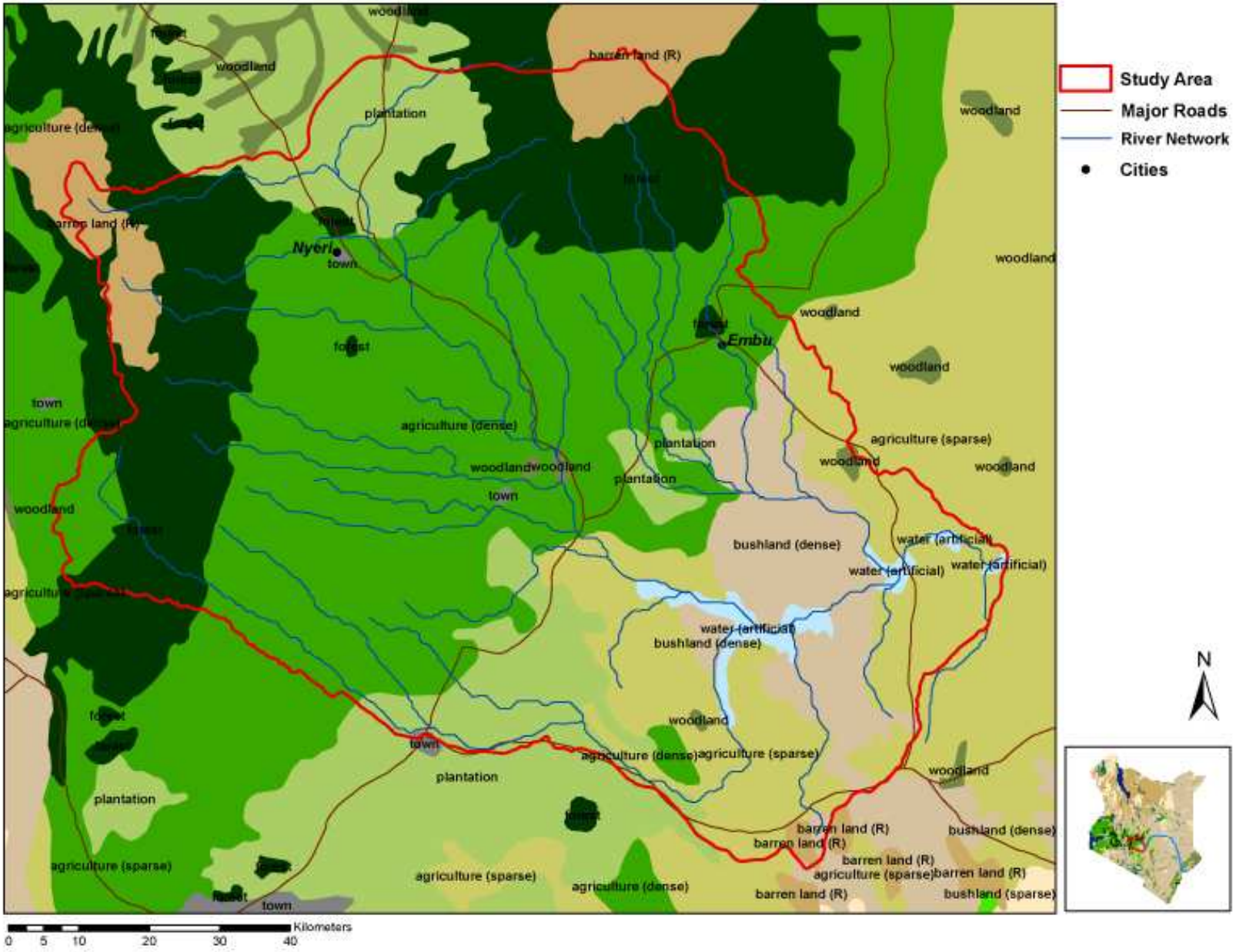
- **Storage water reservoir effects**
- **Effect on power generation**
- **High fluctuation of shorelines**

Study Objective

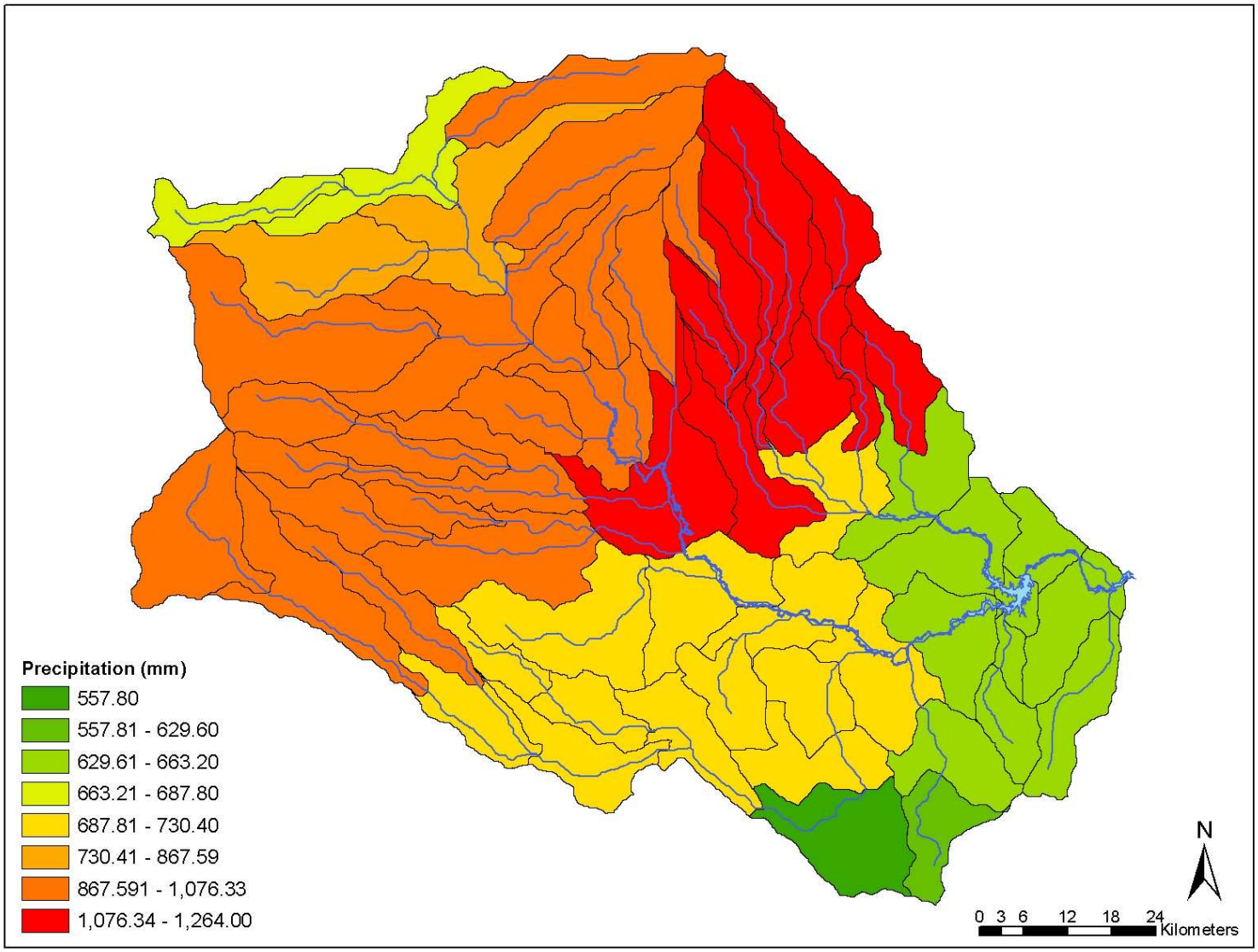
Explore the hydrologic impacts on the Masinga reservoir in response to land use interventions in the Upper Tana River catchment with a focus on varying levels of reforestation.


Mandera
Moyale
Lodwar
Marsabit
Wajir
Marala
Eldoret
Isiolo
Nanyuki
Nakuru
Kericho
Nyeri
Embu
Nairobi
Garissa
Tana River
Kitui
Kajiado
Voi
Study Area
Tana River Network
Cities
agriculture (dense)
agriculture (sparse)
plantation
grassland
forest
bushland (sparse)
bushland (dense)
barren land (R)
barren land (S/G)
swamp
woodland
town
waterbody
water (artificial)
0 40 80 160 240 320
Kilometers
N

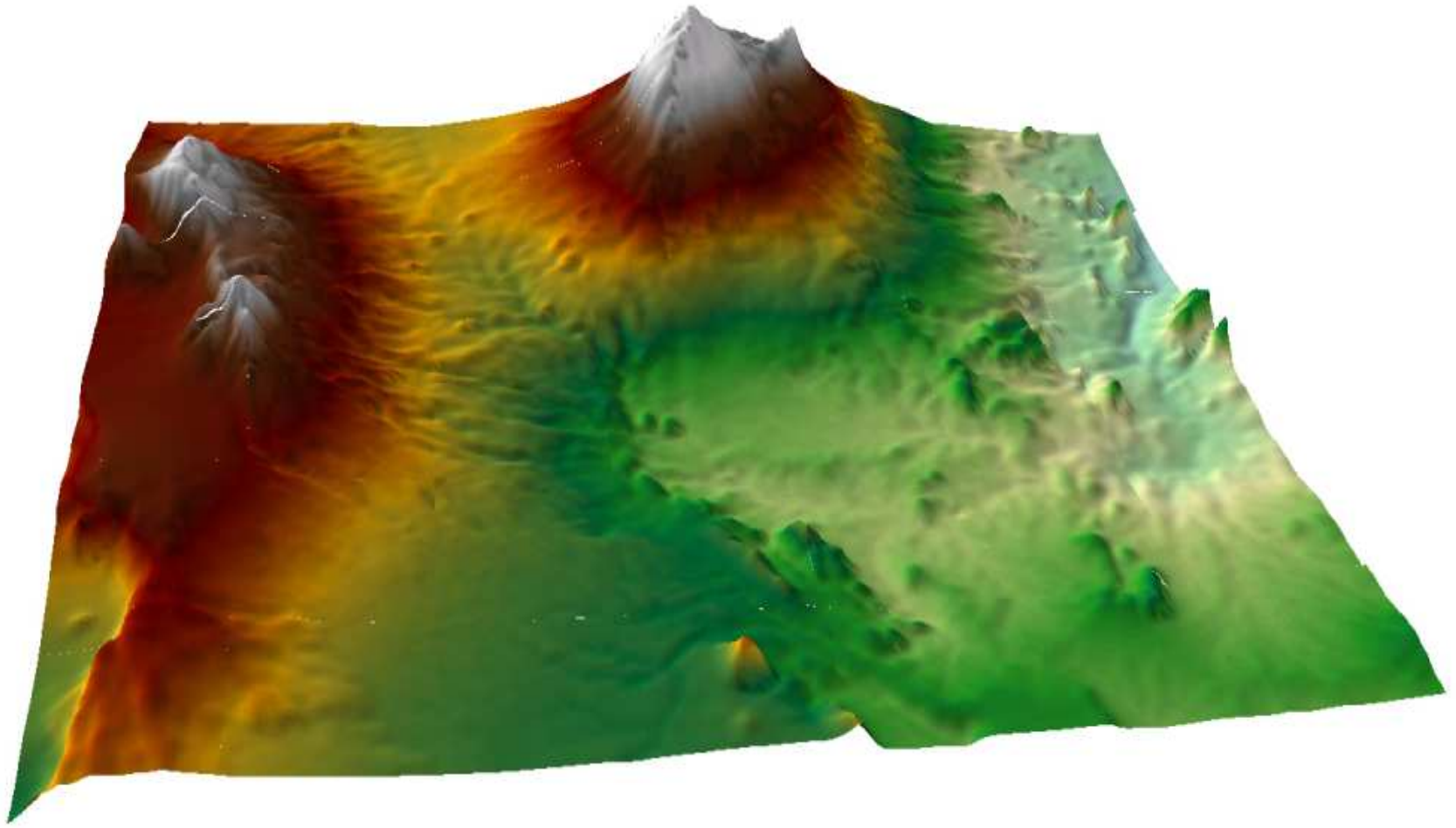
Study Area


Study Area
Major Roads
River Network
Cities
N
Nyeri
town
Embu
woodland
plantation
forest
agriculture (dense)
agriculture (sparse)
barren land (R)
bushland (dense)
bushland (sparse)
water (artificial)
town
Kilometers
0 5 10 20 30 40

Average Annual Rainfall

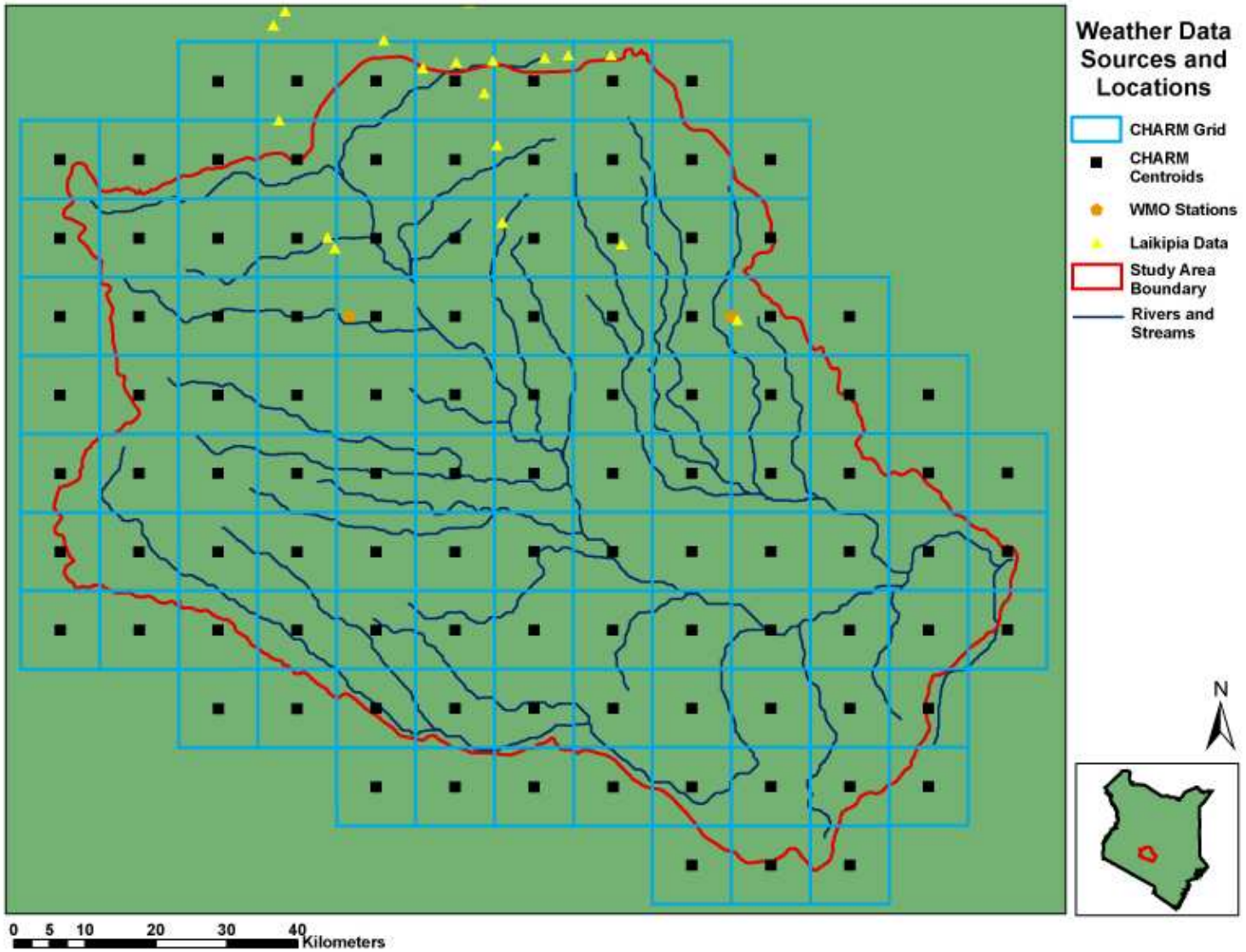


Elevation

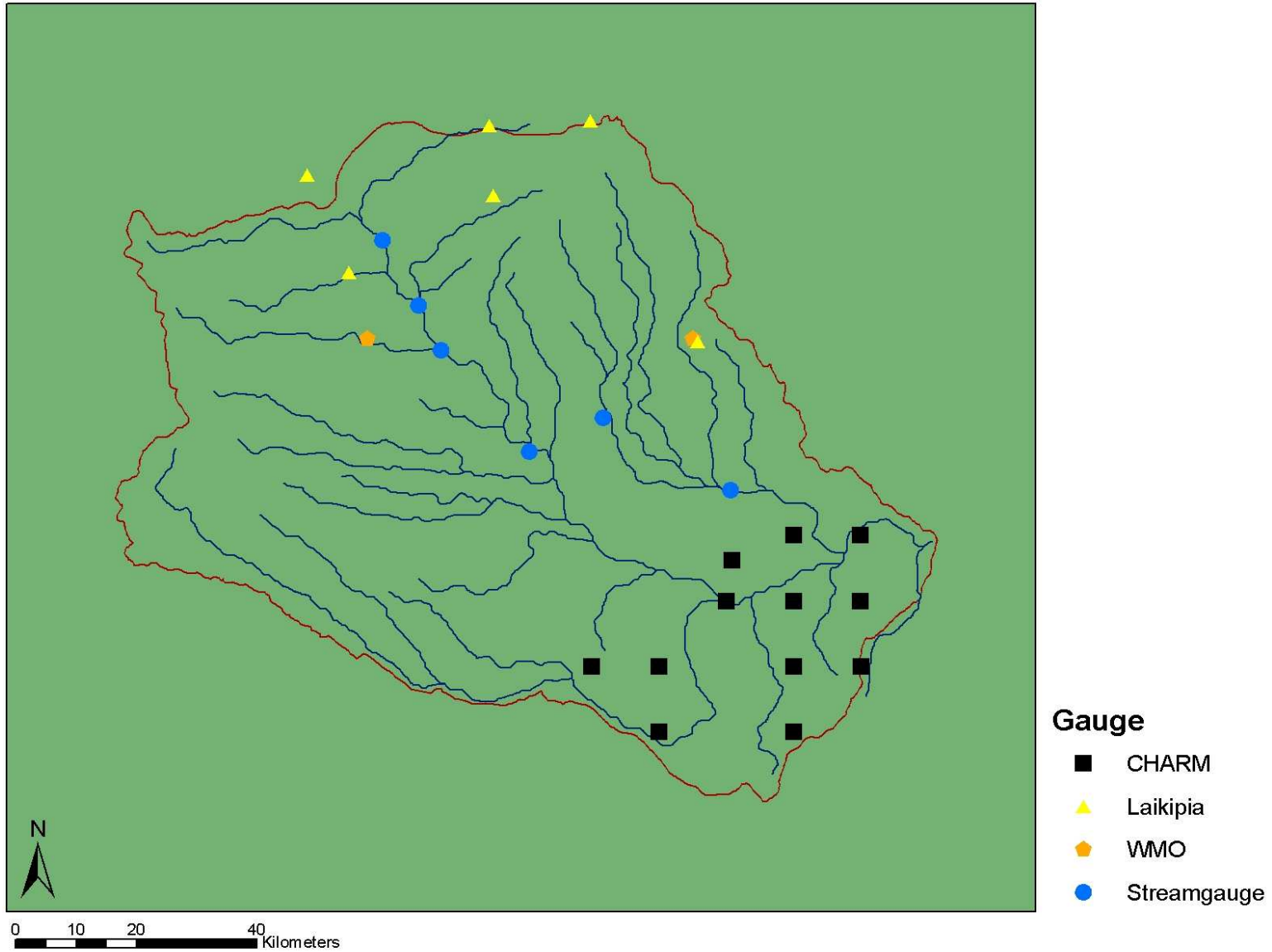


3-D elevation graphic derived from 100-m DEM for the upper Tana River Basin.

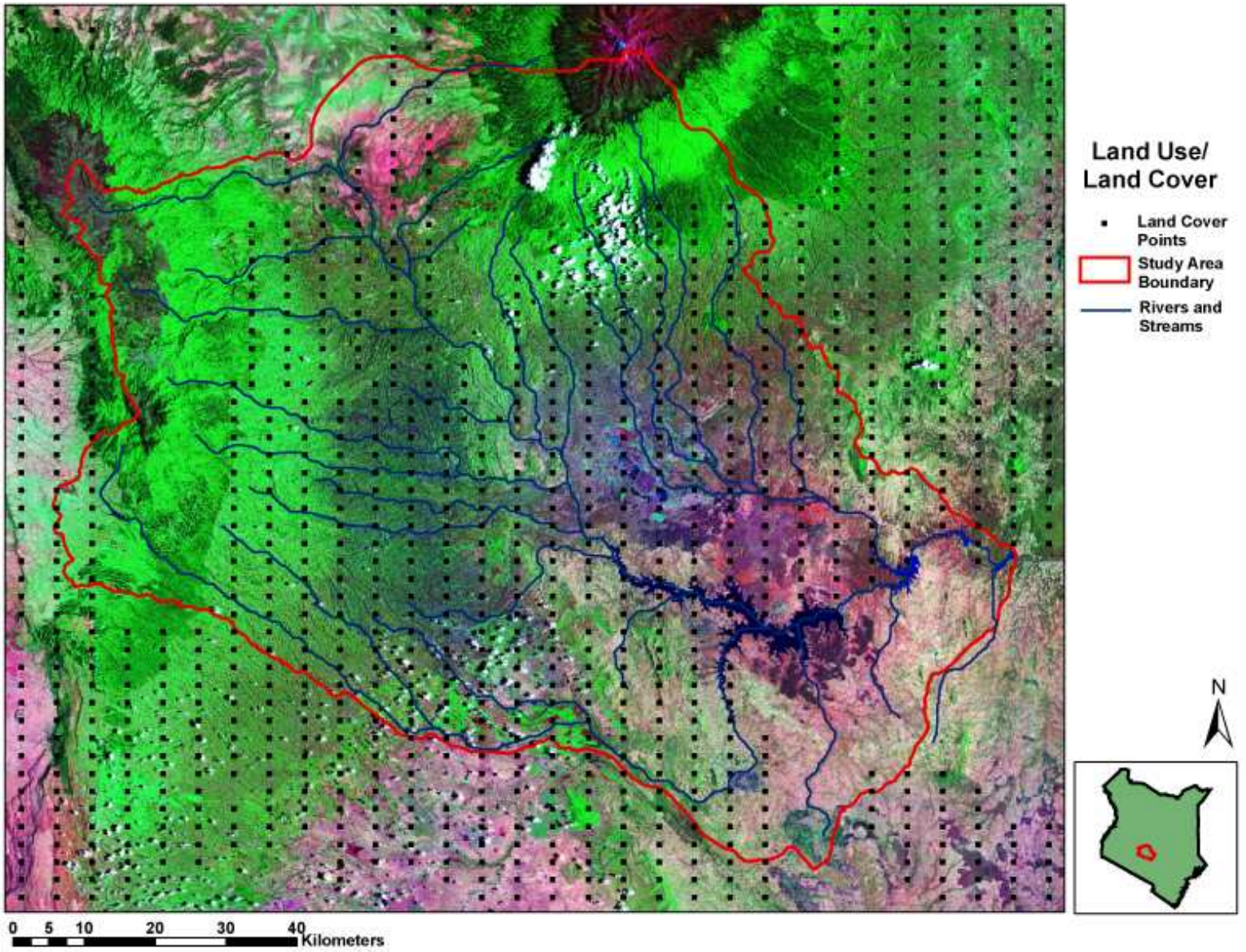
Climate Data Sources and Locations



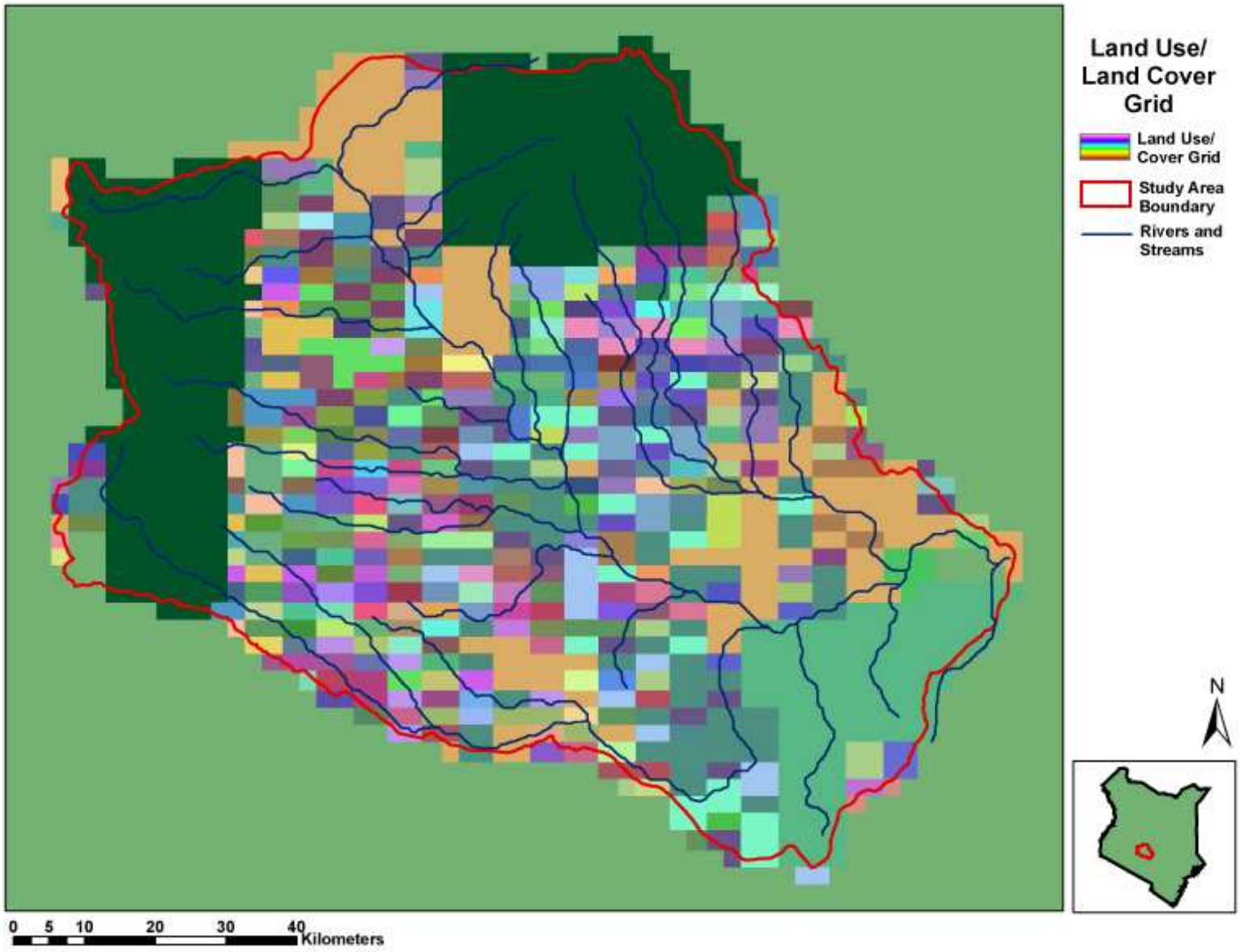
Gauge Locations for Model Simulation



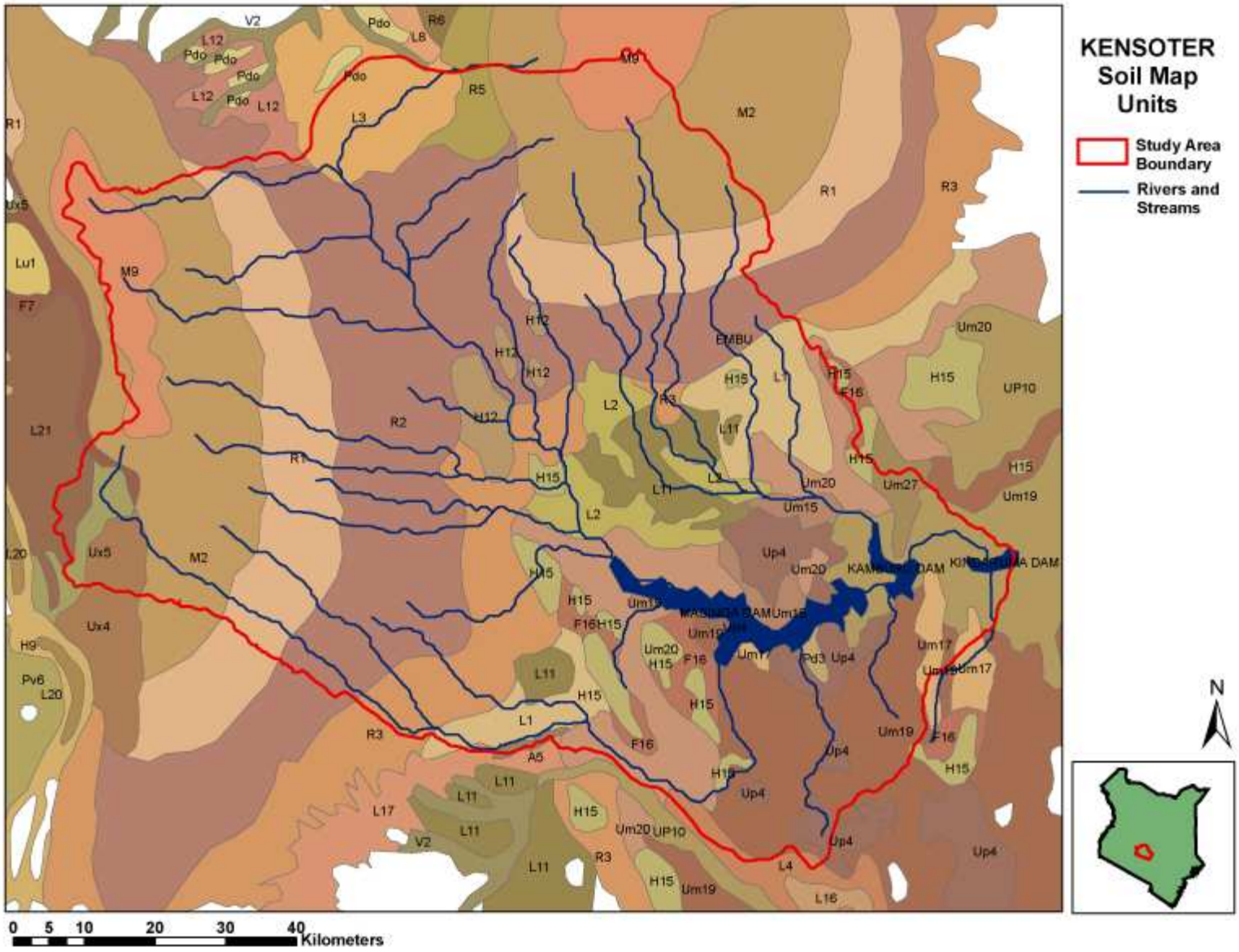
DRSRS Land Use Survey Point Locations



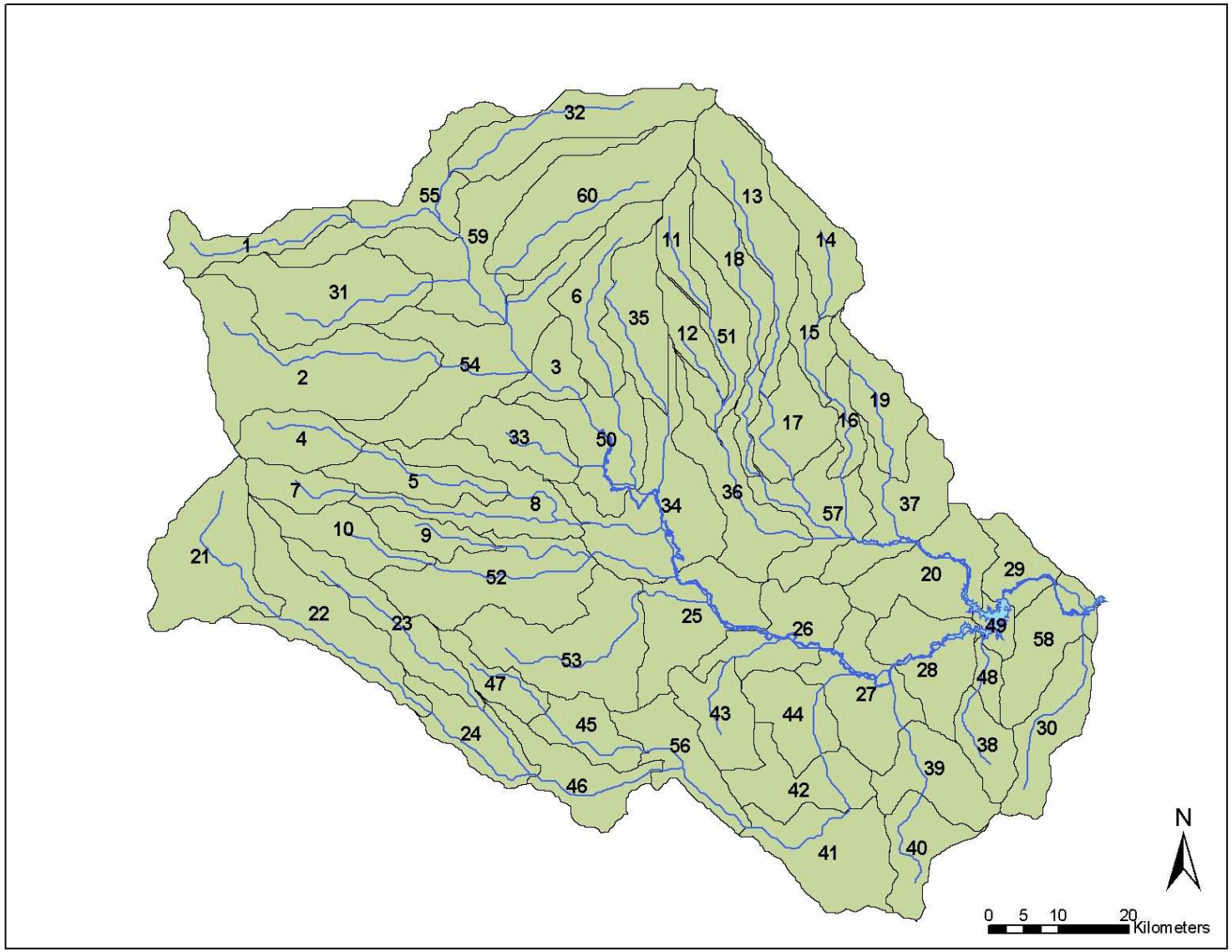
Land Use Model Input



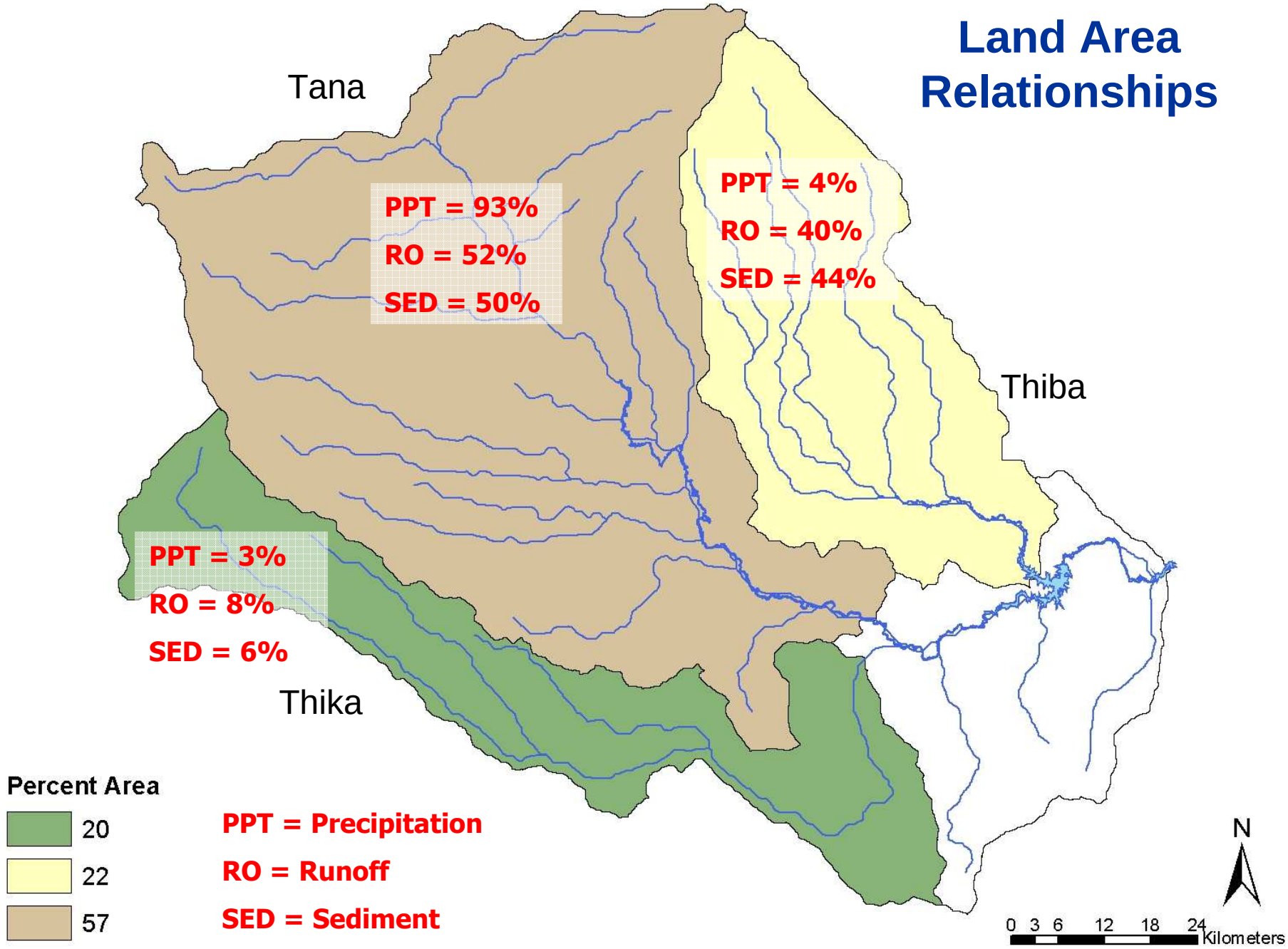
Kenya Soil and Terrain Database



SWAT Subbasin Delineation

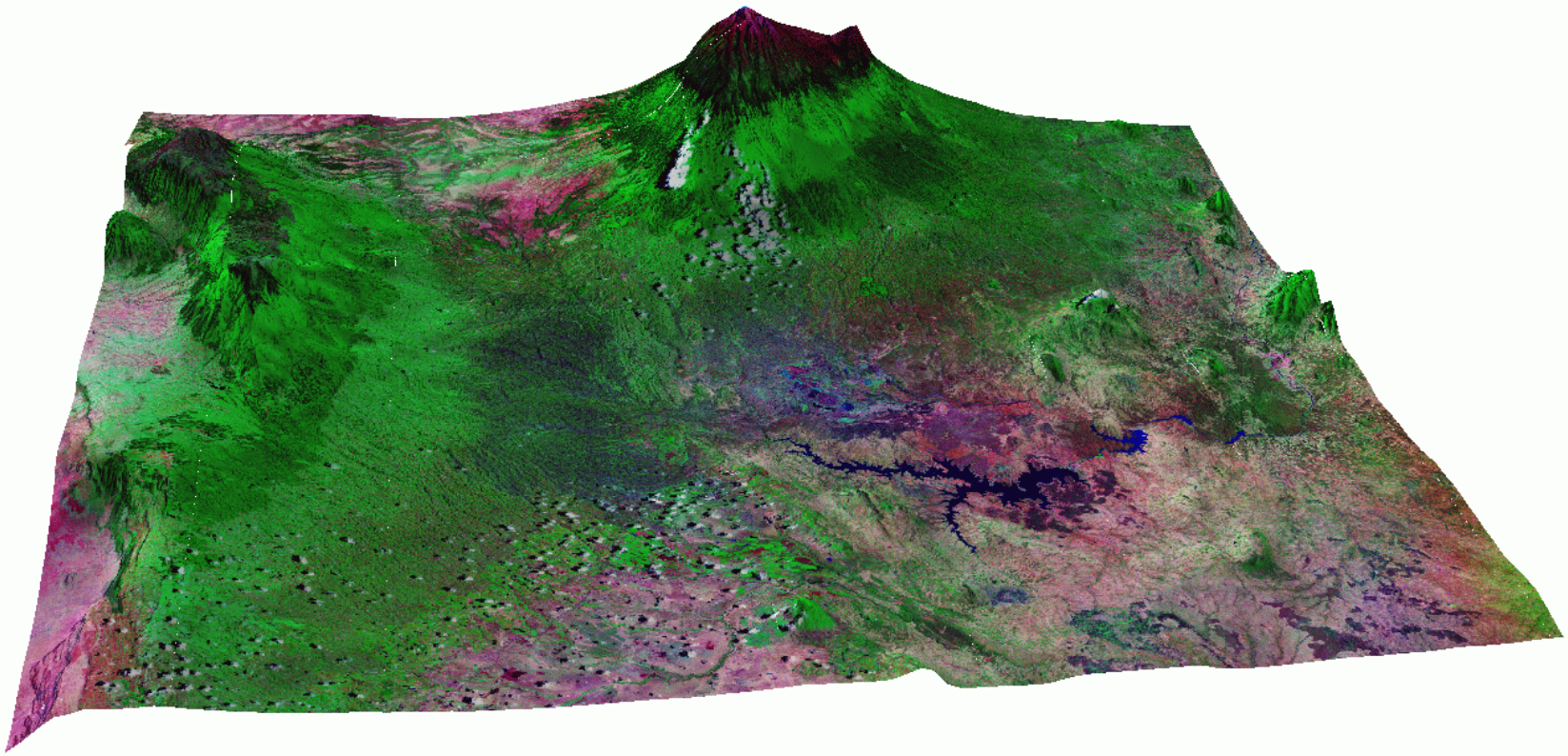


Land Area Relationships



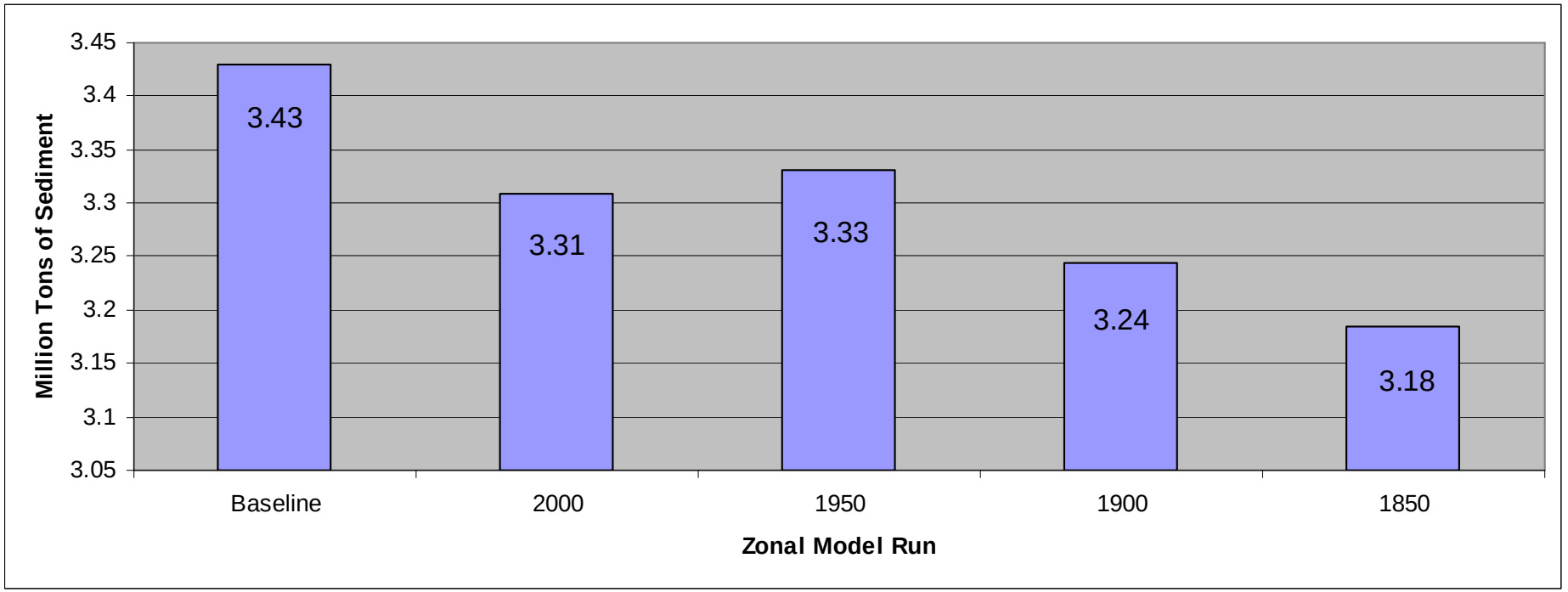
Reforestation Scenarios

- Reforestation scenarios were implemented as full replacement of land by forest above a certain elevation.
- The GIS was used to build a conditional replacement model using the land use grid and the DEM. This allowed spatial representation of the scenarios
- For the base scenario, the areas designated as forest were left intact as were all other land uses.



Graded reforestation scenarios of 2000, 1950, 1900
and 1850m elevation zones

Reforestation Results:
Average Annual Sediment Yield for Entire Basin



SPATIAL SCIENCES LABORATORY

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Integrating information technology and natural resource management

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