

## Hydrological modeling for pilot watersheds

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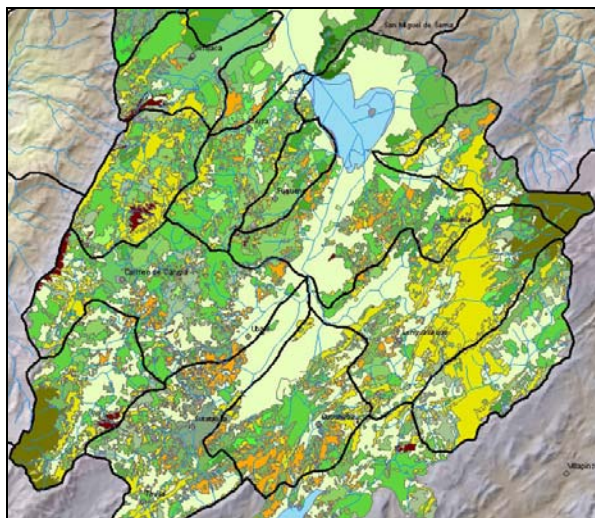
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“Andean Watersheds” Project is conducted in the Andean region of Colombia, Ecuador, Peru and Bolivia. Eleven pilot watersheds were selected in order to analyze mechanisms of payment for environmental services using CONDESAN approach. The selected pilot watersheds were: La Miel, Fuquene and Neusa in Colombia; El Angel and Ambato in Ecuador; Piura, Jequetepeque, Arequipa and Altomayo in Peru; and Tunari in Bolivia.

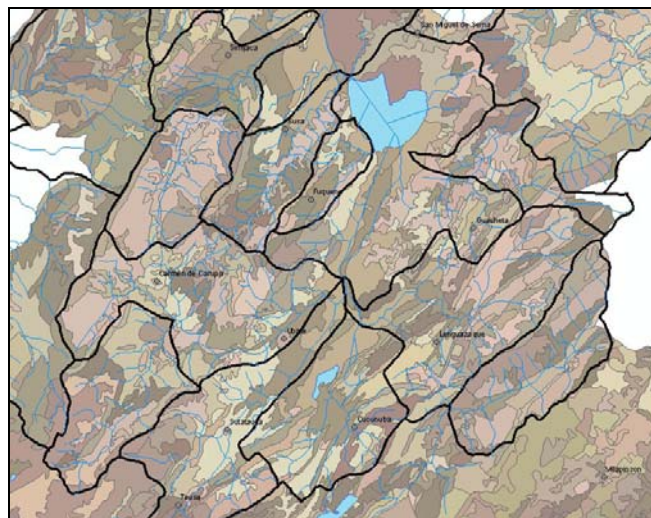
During 2004, recollection of biophysical and socioeconomic basic data has been continued as a requirement to apply hydrological and socioeconomic models. The basic data consists mainly on maps (slopes, rivers, soil types, land use and land cover), hydro climatic data (daily precipitation, temperature, wind speed, relative humidity, evaporation, dew point, stream and sediments), management practices, labor profiles, population, and rural incomes, among others. The watersheds for which most information is already available in the project databases are: La Miel, Neusa, Fuquene, El Angel and Altomayo. Partial information is available for the other pilot sites (Box 1).

With the basic data a hydrological model known as “Soil and Water Assessment Tool-SWAT” has been applied to analyze in an integrated manner characteristics of land use, digital terrain model, soil types and climatic data through an ArcView 3.1 interface. The analysis had allowed determining Hydrological Response Units -URH as the most detailed unit for watershed analysis. Hydrological response is estimated through the determination of runoff, lateral flows, percolation, water soil retention, potential and real evaporation, contribution to stream flows and sedimentation per each unit. The hydrological behavior is related then, with the sort of land use and cover. In another words, the impact of current land use in the water availability and the sedimentation processes is achieved. To illustrate the kind of information that is overlapped for each watershed to determine HRU, some thematic maps for Fuquene watershed are shown below (Figure 1-6)

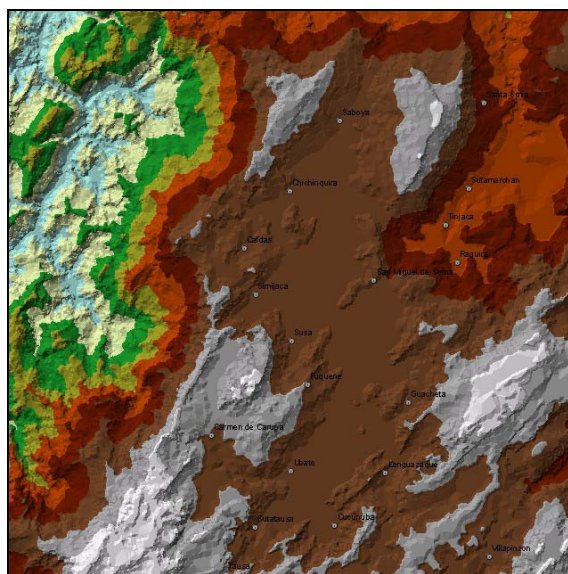
This hydrological model was validated using long periods of measured data of stream flows (Figure 7), and in some cases (La Miel, Piura, Ambato and Altomayo) a rainfall simulator had been taken to the field for verification of infiltration, runoff and sediments concentration. The hydrological modeling is completed for La Miel, Fuquene, Neusa, El Angel and Altomayo watersheds. Detailed information about all pilot sites can be request at [cuencas@cgiar.org](mailto:cuencas@cgiar.org).



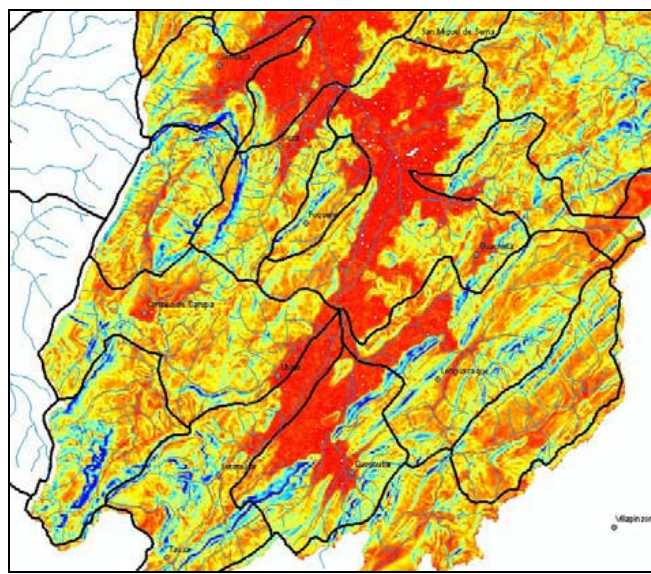
**Figure 1. Current Land use for Fuquene watershed (Colombia).**



**Figure 2. Soils map of Fuquene watershed and subcatchments (Colombia).**



**Figure 3. Digital Elevation Model of Fuquene watershed (Colombia).**



**Figure 4. Slopes map of Fuquene watershed and subcatchments (Colombia).**



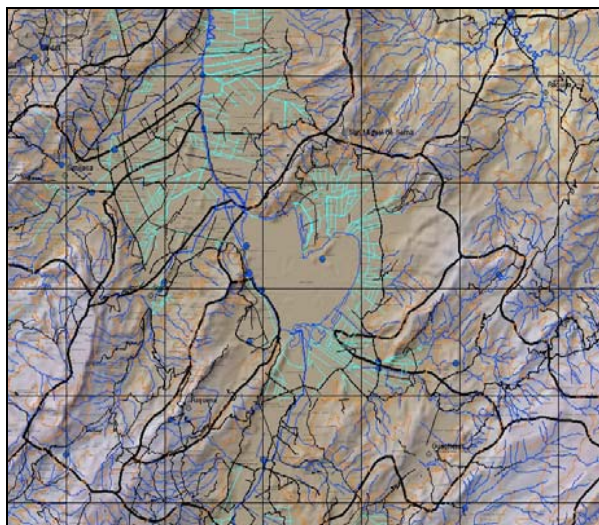


Figure 5. Rivers map of Fuquene watershed and sub-catchments (Colombia).

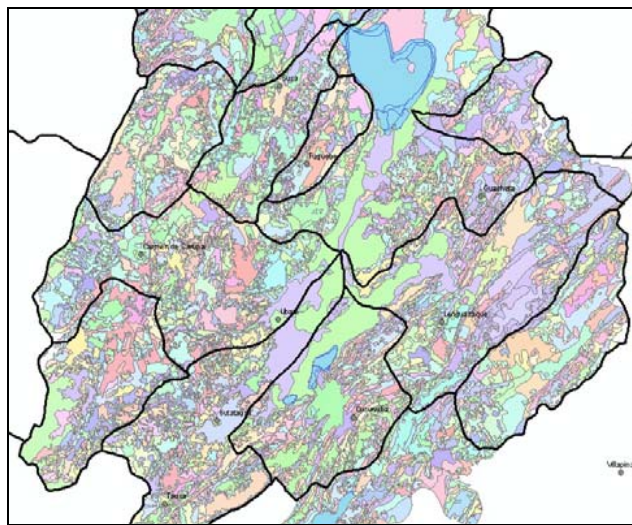


Figure 6. Hydrological Response Units of Fuquene watershed (Colombia).

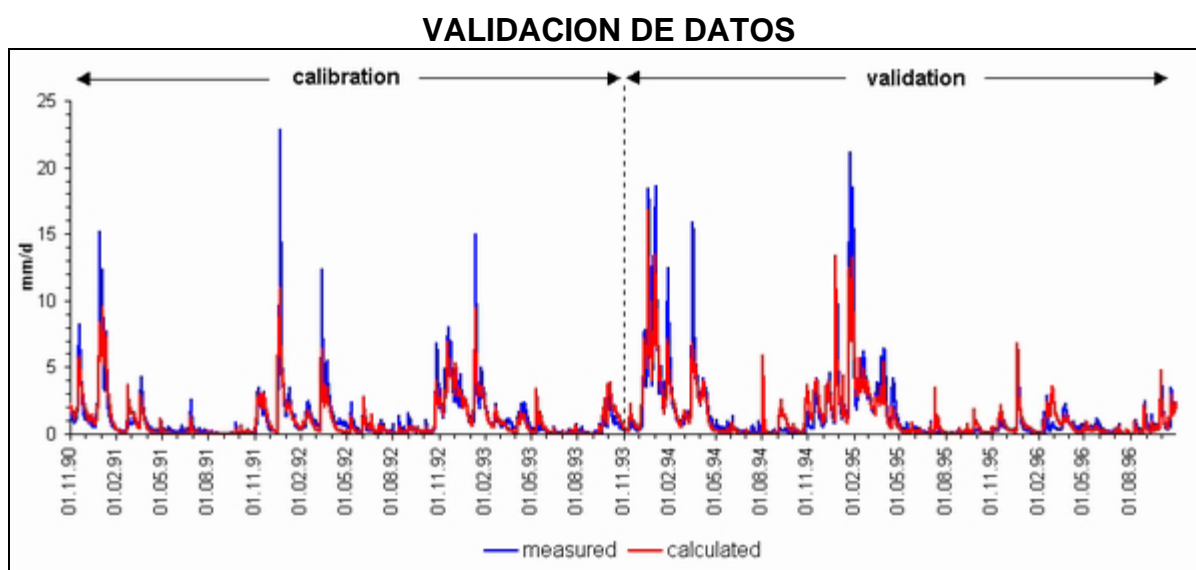


Figure 7. Calibration and validation of hydrological model SWAT for Fuquene Watershed