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Tropical Forested Watersheds: Hydrologic and Soils Response to Major Uses or Conversions, by L.S. Hamilton with P.N. King. Westview Press, Boulder, Co. (1983), 168 p., $23.00, paperback.

In this book, Hamilton and King present the results of a workshop held recently to consider what effect various land use practices have on the soil and water regime, in relation to undisturbed tropical forest. Since this book is concerned with water availability after conversions, it is an important book because it addresses a very major concern of both conservationists and planners. It is also a very dangerous book if accepted at face value by planners, especially concerning the advantages and disadvantages of the conversion of natural undisturbed forest to other uses.

Several uses of forested land are considered, covering the spectrum from the collection of minor forest produce to commercial felling. Conversions cover the whole range from tree plantations to annual cropping. The effects that are looked at are changes in the water table, streamflow quantity, temporal distribution of streamflow quantity, erosion rates, stream sedimentation and nutrient outflow.

A summary of the problem is as follows. There is rain or fog over an area of forest. The rain could either be a drizzle or a storm. Some of the water that is precipitated is retained on the leaves, and some falls on the ground. What reaches the ground is either absorbed by the soil, evaporates, or runs off. A portion of what is absorbed reaches the water table. The runoff contributes to the level of water in the streams, and in the process might carry off part of the soil and nutrients with it. Obviously, how much goes into the water table and the quantity and timing of what goes down the stream are issues of critical planning concern.

A summary of the more interesting assertions follows below. The collection of minor forest produce does not, in general, affect the water regime, though litter removal reduces infiltration into the soil. Shifting cultivation results in greater stream flow than in undisturbed forest, and the conventional wisdom is that flooding might result. However, the conclusion reached here is that there is no compelling reason to move people indulging in 'stable' shifting cultivation out of watersheds. True, perhaps, but how often does one encounter 'stable' shifting cultivation? Also, the contention that surrounding fallow traps eroded soil strikes me as a bit dubious. Rivers in Central India which I am familiar with acquire this lovely red colour when they go through areas of shifting cultivation. Surrounding fallows don't seem to be doing much here.

Fuelwood removal leads to long term increases in water flows *provided* it is at a sustainable level, and commercial harvesting results in an increase in the water table *provided* it is done cleanly (Emphases mine; I will come back to this point later). Splash erosion in forest is worse than in the open: unfortunately, in the example given, it rained 51 mm in 36 hours – a light drizzle by our standards, and hardly likely to be typical of tropical conditions. Flooding after storms is not a consequence of increased streamflow but of increased sedimentation adding to the total volume. Maybe so but people still get killed and property still gets damaged.

Grazing seems to have no effect except on nutrient outflow in comparison with undisturbed forest, but overgrazing is harmful. With burning, there are increases in streamflow, and also major increases in flood peaks. Erosion is a factor, also.

Conversion of forests to plantations does not affect the water table once the plantations are mature. There are also no changes in streamflow at this stage. This is a major bone of contention between conservationists and foresters, and the authors indicate that arguments used by conservationists that water availability is decreased by conversion are spurious. I contend that the database they use to arrive at this result is so scanty that it is not even worth discussing.

Conversion to grassland results in more water all around, since interception losses in foliage as well as evapotranspiration losses are less. The significantly higher ground temperatures in grassland and the effect these might have are inadvertently omitted.

Extractive crops such as tea result in a major increase in erosion, but most of the damage seems to be done by badly planned roads. With annual crops, the groundwater levels increase, as does streamflow. (With due respect, I would advise the authors to look at the water regime some time when either peanuts or sugarcane are planted.) For agroforestry, very little data exists, but soil conservation measures are indicated, Possibly the most controversial conclusion is that reforestation might result in a decrease in water yields, due to an increased uptake of water by the trees that are planted. In a major reforestation project on degraded coastal land that I am familiar with, the water table has risen significantly in the last few years. Maybe the authors have a different explanation for this. It is not clear yet from the above example whether the rise in the water table was a consequence of the afforestation or whether it was a result of the extremely stringent soil and water conservation techniques applied. However, the last should not be an issue; it seems pointless to carry out an exercise in afforestation without soil conservation and water conservation measures at the same time; apart from anything else the trees grow faster.

In general, cases that contradict the hypothesis being presented in each chapter are explained away by individual case histories. Much reliance is placed on data from paired watershed experiments at the Coweeta Hydrologic Laboratory in North Carolina, as the necessary experimentation to determine an effect has not been done anywhere. else. I wish it was so easy to generalise. Rainfall patterns in the southeastern United States are different from those of the monsoonal tropics; rainfall intensities are different; the thickness and persistence of humus on the ground would be different due to faster decomposition rates in the tropics; higher temperatures would result in higher evaporation from open areas.

Every casual hiker through a tropical forest sees phenomena that contradict the wisdom of the book. During the dry season there are flows in small brooks going through forested areas but none in those brooks that flow through grassland. Most forest plantations show heavy erosion, and heavy siltation occurs from areas that have been logged.

No doubt, the authors of this book would argue, a little care would alleviate these negative impacts. But consider the nature of the planning process. The planners base their decisions on whether negative impacts can potentially be avoided. The implementing agencies, who have tight budgets, invariably adopt the cheapest and environmentally most destructive practices. The conclusion that I reach is that these results should certainly not be used for management decisions in the tropics.

If this book has a value, it will be that it has stimulated debate. This hopefully will lead to more carefully planned and justifiable results, because the conservationists, in their turn, are also guilty of propagating rubbish. However, after reading this book I wonder if forest hydrology is in fact really a science. If it is, it becomes necessary to end with a quote ascribed to Mark Twain: "There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment in fact".

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