A scenic landscape photograph of a forested valley. In the foreground, a calm lake reflects the surrounding dense green forest and the mountains in the background. The sky is clear and blue. The overall scene is peaceful and natural.

# Interaction between forest and water: common beliefs being challenged

Virpi Stucki, Programme Officer, Forest Conservation Programme, IUCN Gland

# Forests and hydrological functioning – public perception

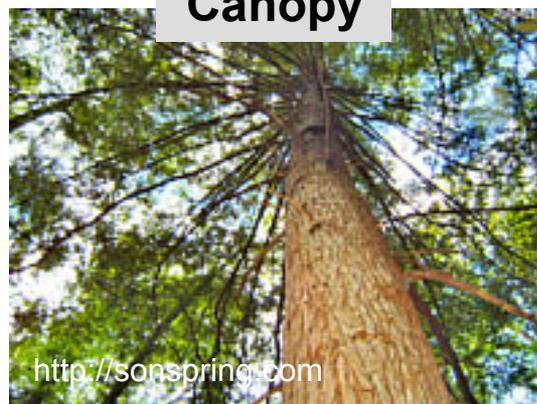
**Roots**



Stabilise soils

Increase  
infiltration

**Canopy**



Affect cloud  
formation and  
rainfall

**Forest floor**

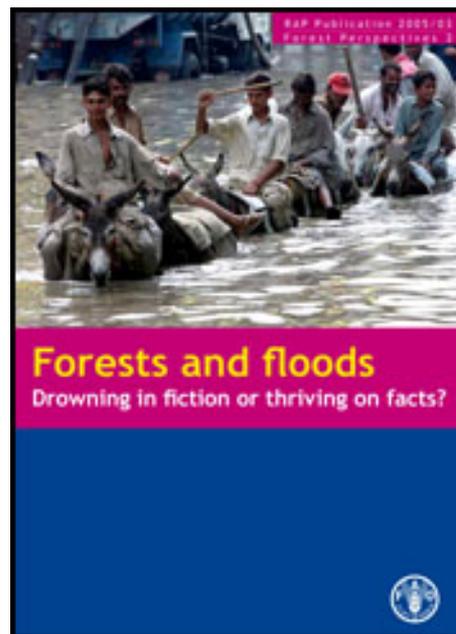


Reduce  
erosion

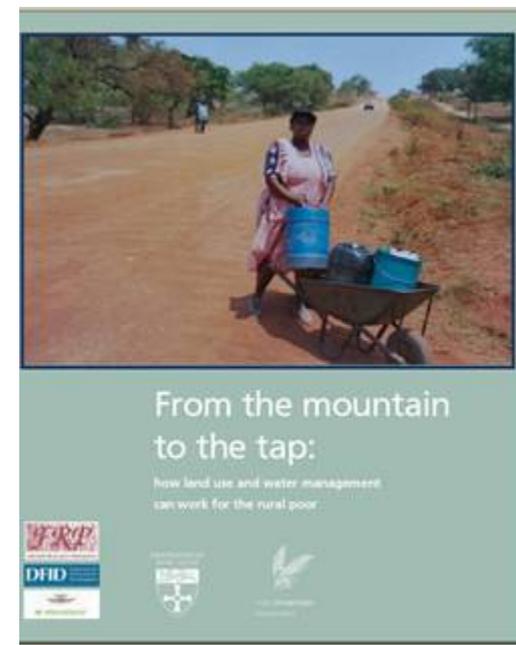
Improve water  
quality

# The links between forests and water have recently been questioned – cont.

**Down with trees**  
Jul 28th 2005  
From *The Economist*  
Planting trees can exacerbate drought and fail to tackle climate change



**Logging does not raise flood risk**  
By Richard Black  
Environment Correspondent, **BBC News** website  
October 12 2005



# Forests and water quantity



# Forests and water quantity – cont.



**« Water for Work »  
programme in South Africa**



Source: [www.voanews.com](http://www.voanews.com)



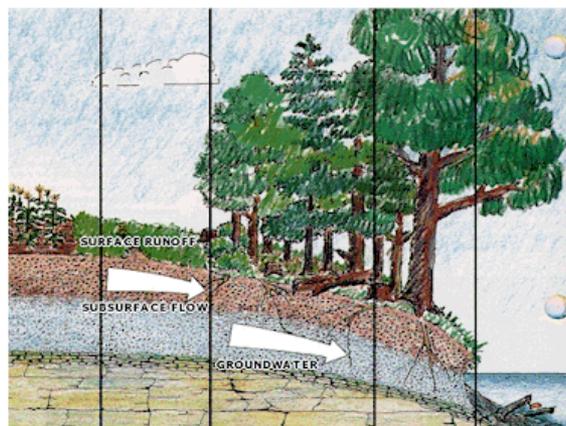
Source: <http://crossingministries.org/>

**Cloud forest in Costa  
Rica**

**Whether forests increase or decrease the overall annual runoff depends on a number of variables, such as:**

- **the age of the forest**
- **topography**
- **species composition**
- **soil properties**
- **meteorological conditions**
- **forest location within the watershed**

# Forests and water quality



**Riparian buffer zones**



**Sukhomajri in India**

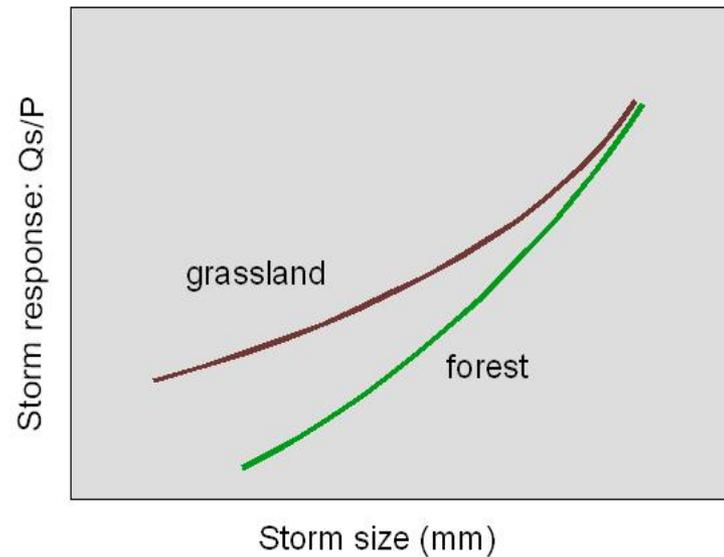
Source: [www.rainwaterharvesting.org](http://www.rainwaterharvesting.org)



## **Studies show that:**

- **Buffer zones typically remove 50-90% of pesticides and nutrients**
- **However, sometimes results are contradictory to expectations**

## Soil wetness is a crucial factor for runoff response



Source: Scott et al. (2004)

## **Scientific experience shows that:**

- **Reforestation reduces small to medium storm events but cannot prevent extreme events**
- **Studies show that the economic losses of cumulative small- and medium size storm events are as big as those of the rare extreme events (Munich Re, 2006)**

# The importance of scale



Source: [www.photob.net/](http://www.photob.net/)



Source: <http://www.dfid.gov.uk/>

*“The severe floods in Eastern India and Bangladesh are not the result of a natural disaster, but of a ruthless exploitation of wood which has been practiced over centuries in the forests of the Himalayas“. Basler Zeitung, 15.9.1998*

# The importance of scale – cont.

## Measurability of land-use effects by basin size (FAO, 2000)

| Impact Type |                      | Basin size [km <sup>2</sup> ] |   |    |                 |                 |                 |                 |
|-------------|----------------------|-------------------------------|---|----|-----------------|-----------------|-----------------|-----------------|
|             |                      | 0.1                           | 1 | 10 | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> |
| Quantity    | Average flow         | x                             | x | x  | x               | –               | –               | –               |
|             | Peak flow            | x                             | x | x  | x               | –               | –               | –               |
|             | Base flow            | x                             | x | x  | x               | –               | –               | –               |
|             | Groundwater recharge | x                             | x | x  | x               | –               | –               | –               |
| Quality     | Sediment load        | x                             | x | x  | x               | –               | –               | –               |
|             | Nutrients            | x                             | x | x  | x               | x               | –               | –               |
|             | Organic matter       | x                             | x | x  | x               | –               | –               | –               |
|             | Pathogens            | x                             | x | x  | –               | –               | –               | –               |
|             | Salinity             | x                             | x | x  | x               | x               | x               | x               |
|             | Pesticides           | x                             | x | x  | x               | x               | x               | x               |
|             | Heavy metals         | x                             | x | x  | x               | x               | x               | x               |
|             | Thermal regime       | x                             | x | –  | –               | –               | –               | –               |

Legend: x = Measurable impact; – = No measurable impact

Source: Discussion Paper 1

- **No single explanation for the water-forest relationship does not mean that there is no relationship**
- **Transferring costs of public policy based on such uncertainty to upland rural poor should be avoided**
- **Scientists should avoid overstating research findings**
- **Underlying assumptions and uncertainties of such findings should be made explicit**
- **Simplistic messages should not be replaced with equally simplistic ones**
- **The multifunctional nature of forests in a landscape should be recognized**



**Protected  
Primary  
Forest**

**Degraded Primary Forest**

**Plantations**

**Secondary forest**

**Secondary forest**

**Degraded  
Forest Lands**

**Permanent  
pasture**

**Permanent  
pasture**

**Intensive  
agricultural land**

**Permanent  
pasture**