Groundwater & Ecosystem Services

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Ecohydrologic Processes

Diagram showing the flow of water and processes involved in ecohydrology, including precipitation, transpiration, canopy interception and evaporation, surface runoff, infiltration, soil stabilization, groundwater storage and flow, and evaporation.
Desired Outcomes = Watershed Ecosystem Services
Ecosystem Services in Hawai’i
Water Flow in Kona

Coast: Water Use

Upland: Water Source

Average Annual Rainfall (mm)
- 750
- 1000
- 1500
- 2000

0 5 10 Kilometers
Plausible Land Use Transitions

- Pasture to Timber
- Sparse to Dense Forest
- Dense Forest to Timber

Brauman et al. (2010) Ag Forest Met
Brauman et al. (2011) Ecohydrology
Land Use Change Affects Aquifer Height

Brauman et al. (2011) Ecohydrology

Pasture to Timber

Sparse to Dense Forest

Dense Forest to Timber

Effect of change in 200 ha of recharge area

Change in height of water table (ft)
Costs/Savings from 200-ha transition (NPV, 50 years, 8% discount, 2010 USD)

\[ \Delta \text{Aquifer Height} = \Delta \text{Pumping Cost} \]

Change in Income to Water Department (one well, continued operations)

- Pasture to Timber
- Sparse to Dense Forest
- Dense Forest to Timber

Brauman et al. (in revision)
Private Costs/Benefits > Impact to Water

Costs/Savings from 200-ha transition (NPV, 50 years, 8% discount, 2010 USD)

Brauman et al. (in revision)
Many Services are Affected

Costs/Savings from 200-ha transition (NPV, 50 years, 8% discount, 2010 USD)

Brauman et al. (in revision)
Brauman et al. (in revision)

Sparse to Dense Forest

Pasture to Timber

Dense Forest to Timber

Costs/Savings from 200-ha transition (NPV, 50 years, 8% discount, 2010 USD)

Brauman et al. (in revision)
Framework for evaluating multi-dimensional water resource tradeoffs

- ecosystem services define question
- change ~ explicit baselines
- connect biophysical to value-able service