

# Trade-offs in the social-ecological values associated with different land-uses in the eastern Amazon

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### Citation:

Gardner, T., J. Barbosa de Oliveira Junior, V. Campos de Oliveira, J. Gomes de Brito, C. Leal, N. Hamada, R. Hughes, L. Juen, Phil Kaufmann, R. Leitao, J. Nessimian, P. Pompeu, F. Rossetti, AND J. Zuanon. Trade-offs in the social-ecological values associated with different land-uses in the eastern Amazon. Presented at Third International Science and policy Conference on the resilience of social & ecological systems, Montpellier, FRANCE, May 04 - 08, 2014.

### Impact/Purpose:

A major area of research within EPA's ORD is to develop approaches to evaluate ecosystem services and the tradeoffs involved in alternate management or development scenarios. A goal of this type of research is to understand the tradeoffs of various actions in terms of the sustainability of their outcomes. This conference presentation (abstract) is not part of the EPA's ecosystem services or sustainable development research. Rather, it is a presentation of initial findings based on data from a large-scale, international, interdisciplinary research effort (Sustainable Amazon Network (Rede Amazônia Sustentável, RAS in Portuguese) involving more than 30 partner organizations working to assess both social and ecological dimensions of land-use sustainability in eastern Brazilian Amazonia. Dr Gardner will present findings concerning land-use sustainability in the Brazilian Amazon: specifically addressing how patterns of ecological and socio-economic condition co-vary across gradients of increasing land-use intensification, and what might be the implications of such trade-offs for environmental conservation and long-term human development opportunities. The research approach adopted by RAS offers three advantages for addressing sustainability problems: (1) the collection of synchronized and co-located ecological and socioeconomic data across broad gradients of past and present human use; (2) a nested sampling design to aid comparison of ecological and socioeconomic conditions associated with different land uses across local, landscape and regional scales; and (3) a strong engagement with a wide variety of actors and non-research institutions. The

RAS datasets can help reconcile social-ecological objectives and reveal trade-offs between farming and conservation at multiple spatial scales by combining data on socioeconomic and ecological values. Dr. Gardner will describe how this data will be helpful to assess how changes in management incentives or regulatory conditions will influence relative ecological and socioeconomic costs and benefits.

### Description:

Current trajectories of rural development across much of the tropics are not sustainable. Forests continue to be cleared at a rate of c. 50,000 km<sup>2</sup> p.a. and much of the remaining forests are severely degraded from the effects of fragmentation, over-exploitation, fire and climate change. In many areas where forests have been cleared for agriculture, land remains under-utilized and poorly managed. Low agricultural yields and degrading soils contribute towards a failure to meet increasing market demands within areas already cleared for agriculture, as well making often limited contributions to improvements in well being for many rural people. A transformation to more sustainable development trajectories in tropical agricultural frontiers depends partly on our ability to identify, understand and reconcile apparent conflicts and trade-offs between human development and environmental objectives, including the maintenance of biodiversity and ecological life-support processes. We present data from a large-scale, interdisciplinary assessment by the Sustainable Amazon Network (Rede Amazônia Sustentável, RAS in Portuguese) of land-use sustainability in the Brazilian Amazon to ask: How do patterns of ecological and socio-economic condition co-vary across gradients of increasing land-use intensification, and what might be the implications of such trade-offs for environmental conservation and long-term human development opportunities? The RAS network has a number of advantages for addressing this question, including the collection of co-located ecological and socioeconomic data at local, landscape and regional scales, and a strong engagement with many actors and non-research institutions. Work to date on conservation-development trade-offs in production landscapes has focussed on local (farm) scale responses of biodiversity to different levels of intensification and total yields. We have a much poorer understanding of how changes in agricultural production affect the provision of key ecosystem services, equity of social outcomes, and how these relationships may differ between local and landscape scales, encompassing the full agricultural-forest mosaic. We will use RAS data on ecological (terrestrial and aquatic biodiversity, above-ground carbon stocks, and soil nutrient status) and socioeconomic (agricultural productivity and profit, labour and producer well-being) indicators from more than 400 sites and rural properties in 36 catchments across two regions to explore conservation development trade-offs at local and landscape scales. At the local scale, this is based on levels of above-ground biomass, from undisturbed primary forest through to degraded and secondary forest and different production systems. At the landscape scale, the level of human impacts will be determined by the extent of deforestation that involves a gradient from 100% to 20% remaining forest cover in each study region, reflecting different periods of recent agricultural colonisation and distances from the deforestation frontier. The findings of this comparative analysis will feed into a broader assessment of the potential for reconciling conservation and socio-economic objectives through changes in agricultural and environmental policies. We reflect on some of the main findings of this more general work including specific scenarios to assess the effects of changes in the management of both agricultural and forested lands, including the adoption of alternative approaches to achieving environmental compliance, options for increased agricultural productivity and ecosystem service markets.

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