

Presentation Information

Presenter	Michael Monticino
Title	Modeling Coupled Natural and Human Systems: Cross-Site and Cross-Cultural Synthesis
Affiliation	University of North Texas
Authors	Michael Monticino, J. Baird Callicott, Miguel Acevedo

Abstract:

The dynamics of land-use (LU) and land cover (LC) change occur within a context of individual and cultural value systems. Values drive LULC choices and the resulting impacts on ecosystems have a feedback effect on social dynamics. Our work has focused on developing a coupled human-natural system model that incorporates the feedback between human values and environmental impact within the context of LU/LC change. The modeling framework allows comparisons across sites and cultures, capturing essential features along natural and social gradients. Our sample study areas include (1) the Elm-Fork Trinity River Corridor in north Texas; (2) the Big Thicket in southeast Texas; (3) the Caparo Forest Reserve in western Venezuela; (4) the Upper Botanamo River Basin in eastern Venezuela; and (5) the Marina Baixa catchment in southern Spain. These sites are all characterized by accelerating LULC change, but at different locations along gradients such as latitude, precipitation and physical and psycho-spiritual connection to place. Multi-agent models are used to simulate the interactions between human stakeholders affecting LULC change and the feedback of LULC actions upon ecological habitats and hydrological response. Values of stakeholders are represented through decision analysis multi-attribute utility functions that capture the value trade-offs and uncertainties inherent in stakeholder decisions. The natural system model represents land-cover transition, hydrological, and wildlife habitat response to LULC changes. The coupled model provides policy makers a tool with which to anticipate LULC changes and the way such changes feed back to affect social dynamics and cultural values. The models also reveal thresholds (or tipping points) and sensitivities of LULC trends. The former includes cascades of development due to policy decisions, and the latter enables policy makers to identify small changes in policy that may have large effects on LU/LC dynamics.