



## Forest transitions: An introduction

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### ABSTRACT

When people speak about 'forest transitions', they generalize about the ways in which the extent of forested land changes as societies undergo industrialization and urbanization. Alexander Mather coined the term 'forest transition', outlined a theory to explain it, and carried out a series of careful historical studies to illustrate the idea. The papers assembled in this special issue both extend and deepen Mather's pathbreaking work. They suggest that the idea of the forest transition, like the much critiqued idea of a demographic transition in population studies, has become a useful theoretical tool for understanding contemporary land use changes.

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### What is a forest transition?

About 20 years ago Alexander (Sandy) Mather began to use the term 'forest transition' (Mather, 1990, 1992; Mather and Needle, 1998) to describe a set of recurring patterns during the past two centuries involving forests and the great transformations (Polanyi, 1944) of urbanization and industrialization. For Mather urbanization and industrialization induced, first, a prolonged decline and, then, a partial recovery in the extent of forests. In this sense the term 'forest transition' is intellectual shorthand for a historical generalization about long term changes in forests and the surrounding human societies. The point of inflection in the transition occurs when deforestation disappears and reforestation commences. With their focus on the forest–non-forest distinction, forest transitions represent a subset of land use transitions (Foley et al., 2005).

In the few short years since its introduction, Sandy Mather's idea has gained intellectual currency as a useful way to summarize the changing historical relationship between forests and societies. If nothing else, the idea has heuristic value, especially during a period when forest decline contributes to both staggering losses of biodiversity and accelerated climate change coupled with rapid increases in human populations (Grimm et al., 2008). Motivated in part by a desire to understand the circumstances that contribute to

forest recovery, analysts have begun to investigate the forces that have driven these changes in forest cover in both general and context specific ways. The papers assembled in this special issue both extend and deepen our understanding of these land use dynamics. They represent what some have come to call land change science (Turner et al., 2007) or sustainability science (Kates et al., 2001). In this introduction we try to situate these works by describing the links between them and Mather's early work on the forest transition.

### Intellectual origins: the idea of the forest transition in the work of Sandy Mather

Alexander Mather lived all of his life in northern Scotland, growing up in a small town some 30 km from Aberdeen University where he earned undergraduate and graduate degrees in Geography and then served as a faculty member until his death in 2006. His early empirical work focused on the history of the changing Scottish landscape. Out of this local experience he distilled an idea with global reach. In a series of works Mather recounted how Scots cleared the forests before 1600 AD only to replant them in the 20th century, with important assistance from professional foresters and the state (Mather, 2004). While Scotland provided an early example for the idea of a forest transition, Mather argued in *Global Forest Resources* (1990) that this pattern characterized a wide range of other places, in North America as well as Europe. In several short articles Mather (1992) and then Mather and Needle (1998) outlined the theoretical basis for expecting a forest transition to occur

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as societies undergo urbanization and industrialization. To corroborate this claim, Mather undertook a comparative historical study of forest cover change in four western and northern European societies (Mather et al., 1998, 1999; Mather and Fairbairn, 2000). Spurred by others who had begun applying his ideas to non-western societies, Mather began late in his career to consider this possibility. In his last article (Mather, 2007) he used forest transition theory to explain the recent turnaround in forest cover trends (from deforestation to reforestation) in three Asian nations (China, India, and Vietnam).

Trained as a human geographer, Mather drew upon an extraordinary range of factors in developing historical explanations for the onset of forest transitions in particular places. Physical geography played a role. As farmers became aware of variations in soil fertility within a locale, they concentrated agricultural production on these lands and forests began to reoccupy abandoned agricultural lands. Cultural factors shaped forest transitions. Professional foresters expressed Enlightenment ideas when they maintained that they could improve landscapes by planting trees (Mather, 2001, 2004). The state often triggered turnarounds in forest cover trends, both in the early European transitions and in the more recent Asian transitions. Changes in sources of energy, particularly the shift from wood to coal, played an important role in the transitions, as did the changing demands for labor and for foodstuffs triggered by the industrial revolution. The enumeration of these different factors, while theoretically suggestive, left unanswered questions about the particular ways in which these factors generated land cover change or interacted with one another to induce land cover change across expanses of land often larger than the nation state. These unanswered questions have provided a rationale for subsequent work on forest transitions, much of which is represented in this special issue.

### The articles

Two articles reformulate forest transition theory. Barbier, Burgess, and Grainger divide the forest transition into two distinct phases and present a micro-economic formulation of the changing conditions faced by landowners that, when aggregated, produce first forest decline and then forest recovery. Lambin and Meyfroidt also break the forest transition into distinct phases. Ecological processes largely explain the gradual decline in rates of deforestation during an initial phase of the forest transition. Socio-economic forces, in particular a willingness to invest in trees by landowners, largely explain subsequent forest recoveries.

Other articles explore crucial factors that shape the timing and extent of forest transitions. As Mather did in his later work, these studies move beyond the boundaries of Europe and North America to look at forest transitions in tropical locales or from a global perspective. Pfaff and Walker argue and then illustrate how agricultural retreat and forest recovery in one place, for example in the northeastern United States, only occurs if other regions simultaneously experience agricultural expansion and export their crops back to the reforesting region. In this sense globalization, by opening up new frontiers for agricultural expansion, encourages forest recovery in older, no longer productive agricultural areas. DeFries and Pandey document the regionally uneven climb up the energy ladder among Indian households that has occurred with urbanization since 2000 and the coincident increase in forest cover in Indian states.

Baptista surveys the suite of recently developed methods that could, in combination, chart the turnaround in forest cover trends in rapidly expanding urban areas of developing countries like Brazil. Finally, Armesto and his collaborators recount the history of forest cover changes in central Chile. Their work looks at for-

est transitions at a larger temporal scale than the other papers, reminding us that, as Mather clearly recognized in his work on Scotland, that forest transitions can unfold over variable periods of time, 500 years in Scotland but only 20–30 years in Vietnam.

Two articles inquire about the meaning of the forest transition. Hecht demonstrates how imaginaries of landscape change in Latin American forest transitions highlight some groups and landscapes while ignoring others. Landscapes dominated by old growth forests get featured while landscapes featuring *mestizo* smallholders are neglected. Finally, Turner exploits the idea that behind every 'is' there is an 'ought'. He outlines how the fluid land use dynamics in the urbanizing societies of the global South offer opportunities for articulating a 'sustainable land architecture'. The frequently observed state interventions to promote land use changes offer communities the opportunity to 'redesign' the landscape in which they live.

### Conclusion

Most recently, the idea of a forest transition has attracted critics (Perz, 2007; Robbins and Fraser, 2003) who see it as a forest focused version of the largely discredited, unilineal conception of history associated with modernization theory. In this context it is useful to recall that Mather developed the idea, originally, as a historical generalization. In this fashion it continues to prove useful to researchers who try to explain concerted and, quite frequently, unanticipated changes in forest cover. Given its generality, the idea of a forest transition is always wrong when applied to a particular case, but it has proven to be indispensable as a conceptual starting point for understanding recent changes in forest cover. In this respect the forest transition resembles the demographic transition. Demographers have repeatedly criticized the idea of a demographic transition while continuing to use it (Rudel and Hooper, 2005). Land change scientists appear to be following a similar intellectual path with the forest transition. The papers assembled here testify, we hope, to the continuing importance of this idea in trying to understand land change and prescribe policies that promote a sustainable land architecture.

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