Forest ecotone survey by line intersect sampling

Piermaria Corona, Gherardo Chirici, and Davide Travaglini

Abstract: Given their ecological relevance, the survey of ecotones is of considerable interest in forest multiresource inventory. To this end, it is useful to set up survey procedures to provide efficient and reliable information about the length of such elements within the landscape mosaic. This note demonstrates a procedure based upon line intersect sampling on remotely sensed imagery. The estimate of ecotone length per unit area is obtained by visual interpretation of the changes from forest to other land use classes along each sampling line. The experimentation carried out in two test areas within forest landscapes of central Italy proves the operative soundness of the proposed procedure, which is more efficient than the classical approach by forest polygon delineation and perimeter mensuration in a GIS environment. Under the examined conditions, samples based on a moderately high number of lines characterized by relatively long length prove to be more efficient than those based on shorter survey units.

Résumé : Étant donné leur importance écologique, l'inventaire des écotones prend une importance considérable dans les inventaires forestiers multiresources. À cet égard, il est utile de mettre en place des méthodes capables de fournir des informations efficaces et fiables sur la longueur de tels éléments dans la mosaïque du paysage. Cette note présente une méthode basée sur un échantillonnage déterminé par l'intersection de lignes sur une image obtenue par télédétection. L'estimation de la longueur d'un écotone par unité de surface est obtenue par une interprétation visuelle des changements qui résultent du passage de la forêt à d'autres classes d'utilisation du territoire le long de chaque ligne d'échantillonnage. L'expérience qui a été réalisée dans deux régions situées dans des paysages forestiers du centre de l'Italie démontre la valeur opérationnelle de la méthode proposée qui est plus efficace que l'approche classique basée sur la délimitation de polygones de forêt et la mesure de leur périmètre avec un SIG. Dans les conditions étudiées, l'échantillonnage basé sur un nombre modérément élevé de lignes relativement longues s'avère plus efficace que celui qui est basé sur de courtes unités d'inventaire.

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Introduction

The interest of forest planners and managers in detailed landscape metrics is rapidly increasing (Baskent and Jordan 1995; Kleinn 2000; Leimgruber et al. 2002). Distinctively, boundaries in the landscape mosaic have direct relevant structural and functional values (e.g., Matlack and Litvaitis 1999; William et al. 2001), e.g., as concerns habitat suitability for animal and plant species. Consequently, the survey of ecotones has become a major consideration in forest multiresource inventory (Brändli et al. 1995; Koehl 2003).

At the landscape level, boundaries between different land use classes usually identify ecotones. Traditionally, the length of such features is determined by polygon delineation on the basis of visual interpretation of remotely sensed imagery (complete mapping) and subsequent perimeter mensu-

ration on each delineated polygon (Haines and Chopping 1996). However, such a procedure might have omission and commission errors, unavoidable in image interpretation and classification by polygon delineation (Carfagna and Gallego 1999).

In this note, a forest ecotone survey procedure based on line intersect sampling is provided for a more efficient assessment overcoming the above-mentioned shortcomings. Ecotone length per unit area is estimated by visual interpretation of the changes from forest to other land use classes along each sampling line displaced on remotely sensed images from the land to be inventoried.

The simple procedure proposed here represents a further refinement in the field of estimation of landscape metrics from sample-based surveys, whose applicative potential is often undervalued, and about which relatively little has been

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P. Corona.¹ Dipartimento di Scienze dell'Ambiente Forestale e delle sue Risorse, Università della Tuscia, via San Camillo de Lellis, 01100 Viterbo, Italy.

G. Chirici and D. Travaglini. Dipartimento di Scienze e Tecnologie Ambientali Forestali, Università di Firenze, via San Bonaventura 13, 50145 Firenze, Italy.

¹Corresponding author (e-mail: piermaria.corona@unitus.it).