Bater, C.W., N.C. Coops, M.A. Wulder, T. Hilker, S.E. Nielson, G. McDermid,
G.B. Stenhouse. 2011. Using digital time-lapse cameras to monitor species-specific understorey and overstorey phenology in support of wildlife habitat assessment. Environmental Monitoring and Assessment. doi: 10.1007/s10661-010-1768-x

Abstract

Critical to habitat management is the understanding of not only the location of animal food resources, but also the timing of their availability. Grizzly bear (*Ursus arctos*) diets, for example, shift seasonally as different vegetation species enter key phenological phases. In this paper, we describe the use of a network of seven ground-based digital camera systems to monitor understorey and overstorey vegetation within species-specific regions of interest. Established across an elevation gradient in western Alberta, Canada, the cameras collected true-colour (RGB) images daily from 13 April 2009 to 27 October 2009. Fourth-order polynomials were fit to an RGB-derived index, which was then compared to field-based observations of phenological phases. Using linear regression to statistically relate the camera and field data, results indicated that 61% ($r^2 = 0.61$, df = 1, $F = 14.3$, $p = 0.0043$) of the variance observed in the field phenological phase data is captured by the cameras for the start of the growing season and 72% ($r^2 = 0.72$, df = 1, $F = 23.09$, $p = 0.0009$) of the variance in length of growing season. Based on the linear regression models, the mean absolute differences in residuals between predicted and observed start of growing season and length of growing season were 4 and 6 days, respectively. This work extends upon previous research by demonstrating that specific understorey and overstorey species can be targeted for phenological monitoring in a forested environment, using readily available digital camera technology and RGB-based vegetation indices.