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Monitoring More Using Photos – (Series)
Part III: Landscape Photography

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Many of us are familiar with using aerial imagery to understand the places where we work. Sometimes we are also lucky enough to work at sites where historical photos of the landscape are available. Repeat photos at designated photo points are often used as part of a monitoring protocol, but until recently these landscape photos (also called "oblique" photos) have been useful mostly for presentations or to get a "feel" for how a site has changed. Now, new analysis techniques are being developed to extract some quantitative data from these landscape photos.

Photo 1: Independence Creek Preserve, Terrell County, TX. Photo Credit: Charlotte Reemts

Landscape photos pose several problems compared to aerial imagery. First, the angle of the camera to various points on the landscape varies, especially in topographically complex sites. Second, pixels in the background of the photo represent a much larger area on the ground than pixels in the foreground. Finally, it is difficult to get repeated photos that match exactly, and small changes in which direction the camera is pointing can make big differences in the resulting photograph.

The first of the analysis techniques that I've investigated is to treat the landscape photo just like an aerial image (Michel et al. 2010). This analysis can be done using a raster-like approach (where the photo is divided into a grid and each square is assigned a cover class) or an object classification approach (where lines are drawn around each cover class). The object classification approach is best applied with software like eCognition; the grid approach can

Photo 2: Sandyland Sanctuary, Hardin County, TX.
Photo Credit: Shawn Benedict

be done easily (if tediously) in ArcGIS. A variation of this method is to analyze only the background of the photograph to minimize the effect of changes in camera angle (Roush et al 2007): such changes will have a great effect on the foreground than the background.

Another approach is to sample the photograph. Clark and Hardegree (2005) developed a method where horizontal lines of pixels (equivalent to transects) are randomly selected and each pixel in the "transect" is classified. By selecting more transects in the background of the photograph, this method can correct for the larger area represented by the background pixels.

I am still in the early stages of trying out the different techniques. The analyses seem more defensible in areas where you have a wide view of a large landscape (Photo 1) and where repeated photos will capture most of the same view. However, even in sites with a limited field of view, some changes are obvious enough that small discrepancies between the photos don't matter too much (Photos 2 and 3).

Photo 3: Sandyland Sanctuary, Hardin County, TX
Photo Credit: Shawn Benedict

References:

Clark, P. E. and S. P. Hardegree (2005). "Quantifying vegetation change by point sampling landscape photography time series." Rangeland Ecology & Management **58**: 588-597.

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