

Using Digital Photography to Quantify Herb Cover in a Temperate Riparian Forest Community

Sarah Duffy and Eric Berry

Department of Biology, Saint Anselm College, Manchester, New Hampshire USA

Background and Objectives

Cover and composition of herbaceous vegetation has been traditionally measured using techniques that visually estimate percent cover or percent cover categories (e.g. 0–10, 10–20%, etc.). However, such methods are inherently subjective and are prone to observer bias, meaning that they are not accurately repeatable (Kercher *et al.* 2003).

Recent technological advances in digital imaging offer potential to more objectively quantify ground cover and composition in a manner that is both accurate and repeatable (Luscier *et al.* 2006). In this study we sampled herb cover in a temperate riparian forest community using digital photographs and analyses outlined in *Adobe Photoshop CS3 Classroom in a Book*.

Methods

- **Field site:** Riparian forest community, Amherst CC, Amherst, NH
- **Data collection:**
 - Field sampling October 3 and 10, 2010
 - Sample size of 54 1-m² quadrats along 11 50-meter transects
 - Herb vegetation flattened in each plot to take a 2-D image using a Canon EOX
- **Digital analysis:**
 - In Photoshop CS5 extended: Each photograph was cropped to 1/4th of the square meter using the 0.5 meter marks on quadrat as reference (Figure 1)
 - Measured the number of pixels that equaled 0.5 meters to calibrate the scale per image
 - Identified the range of the color green to be selected by the program as herbs with Select>Color Range tool. Once selection was made, edited as necessary (Figure 2)
 - Photoshop measured the area (m²) that was selected, and was recorded as the herb cover. The herb cover area for each quadrat was the sum of each quarter square meter.

Results

- Herb cover (N = 54 plots) ranged from 0.0% to 72.5% and averaged 27.1 % (S.D. = 19.6%)
- Although our data revealed substantial variation in herb cover, this variation did not correlate with any of the following tree composition parameters (H. Ronan, unpublished data):
 - tree cover (BSA): $R^2 = 1.6\%$, $P = 0.72$
 - tree density: $R^2 = 2.76\%$, $P = 0.63$
 - tree species richness: $R^2 = 0.7\%$, $P = 0.81$



Figure 1: Sample image taken from transect 7, at 40 meter mark. Cropped along dotted lines to equal a quarter square meter based on 0.5 meter mark.



Figure 2: Sample image after cropped to a quarter meter. Red mask was put in to convey what was identified and selected as herbs.

Discussion and Further Research

There is great potential in using digital imaging tools for measuring field data such as herb cover. Photoshop is a widely used program and is accessible to the public, so developing a methodology for this program is useful because it can be easily repeated. By instructing the program to select a specific range of the color green, it expedited the process of selecting the herbs to be measured and added to its accuracy. Difficulty encountered and recommended changes:

- Sunlight caused a washing out of color, and spots of light caused difficulty in selecting herbs. Recommended approach would be to create artificial shading, for example with an umbrella, and always use the flash.
- Although when collecting data there was a conscience effort to photograph from directly above, there was noted discrepancies in the angle that the quadrat was photographed, which would cause error measuring the area. A way to improve the approach is to photograph from a higher height, such as from a stepping stool.

References

- Luscier, J.D., W. L. Thompson, J. M. Wilson, B. E. Gorham, and L. D. Dragut. 2006. Using digital photographs and object-based image analysis to estimate percent ground cover in vegetation plots. *Front Ecol Environ* 4: 408–413
- Kercher SM, Frieswyk CB, and Zedler JB. 2003. Effects of sampling teams and estimation methods on the assessment of plant cover. *J Veg Sci* 14: 899–906.
- *Adobe Photoshop CS3 Classroom in a Book* Adobe Press 2007. Print.

Acknowledgments

We would like to thank the Amherst Country Club for allowing us access to their property for field sampling. Funding was provided by the Saint Anselm College Biology Department.