Animating Repeat Glacier Photography—A Tool for Science and Education

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Abstract. Repeat photography is widely used to document temporal environmental changes such as the dynamic landscape evolution associated with glacial retreat or advance. Dramatic changes illustrated by static side-by-side before and after images are easy for the viewer to interpret, but more subtle changes may escape the viewer's attention if they are unfamiliar with the area or unable to study the images in detail. Introducing the dynamic element of digitally dissolving the before image into the after image makes subtle changes perceptible and dramatic changes even more striking. The technique of photo dissolving was applied to several repeat photo pairs of Glacier Bay National Park and Preserve glaciers. The animated images present over a century of landscape change in the matter of a few seconds. The ability of this technique to effectively communicate complex visual information to audiences ranging from scientific professionals to members of the general public makes it a useful tool for both educators and scientists.

Introduction

Glaciers are a significant geologic feature of Glacier Bay National Park and Preserve. Glaciers are highly sensitive to changes in temperature and precipitation and dynamically react to climatic drivers by thickening and advancing during periods of increased snowfall and thinning and retreating during periods of increased ice ablation. Alteration of the Glacier Bay glaciers directly influences the physical landscape, the local hydrologic regime, and the diversity and spatial distribution of biologic communities in the park. Understanding the scale and pace of past glacial system change in Glacier Bay provides critical insight into how these processes may continue in the future. Repeat photography of glaciers provides an efficient and cost-effective method to document these temporal changes.

This paper summarizes the methods and benefits of animating the repeat glacier photo-pairs taken during a joint National Park Service–U.S. Geological Survey study conducted in Glacier Bay, Alaska, during the summers of 2003 and 2004. The goal of this work was to develop a method to present the study results to a diverse audience composed of Glacier Bay National Park management and staff, the scientific community, and the general public.

Methods

The procedure for creating the animated images in Microsoft® PowerPoint® consists of aligning the before and after images on the same slide with the before image in front of the after image (fig. 1) and applying the "dissolve out" custom animation option to the before image (figs. 2 and 3). The results of this procedure is a PowerPoint slide that displays the before image and when the image is clicked on, the before image dissolves into the after image (fig. 4). The most challenging aspect of this process is aligning the before and after images. Variations in camera formats, lens focal length, or slight location errors generally are the cause of most discrepancies between the before and after images. It is possible to crop or transform images to compensate for minor differences, but the most effective strategy is making a good match in the field.
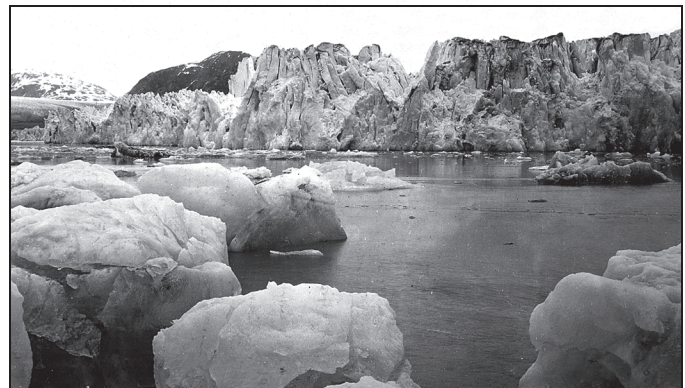
Figure 1.   Before Photo: Muir Glacier, Glacier Bay National Park, Alaska. Photograph by G.K. Gilbert,1899. (Courtesy of the U.S. Geological Survey Photo Library.)

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Figure 2. Intermediate step of the Microsoft® PowerPoint® dissolve out custom animation of the Before Photo revealing the underlying After Photo. After Photo: Muir Inlet, Glacier Bay National Park, Alaska. (Photograph by R.D. Karpilo, 2004.)

Figure 4. Final step of the Microsoft® PowerPoint® dissolve out custom animation revealing the After Photo.

Discussion and Conclusions

Animating the photo pairs provides an interesting and informative view of how the glaciers and ecosystem of Glacier Bay National Park have changed over the past 100 years. Dramatic changes illustrated by static side-by-side before and after images are easy for the viewer to interpret, but more subtle changes may escape the viewer's attention if they are unfamiliar with the area or unable to study the images in detail. Introducing the dynamic element of digitally dissolving the before image into the after image makes subtle changes perceptible and dramatic changes even more striking. The ability of this technique to effectively communicate complex visual information to audiences ranging from scientific professionals to members of the general public makes it a useful tool for both educators and scientists.

Figure 3. Intermediate step of the Microsoft® PowerPoint dissolve out custom animation of the Before Photo revealing the underlying After Photo.

Acknowledgments

Results

The animated photo pairs succinctly present more than 100 years of complex physiographic and ecosystem changes in a 10 second video clip. This project produced eight animations of the glacier photo pairs taken in Glacier Bay National Park.

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