Aerial photography

CATEGORY: Obtaining and using resources

Aerial photography, which dates to the nineteenth century, has enabled scientists to quantify and predict changes in land use, soil erosion, agricultural development, water resources, habitat, vegetation distribution, animal and human populations, and ecosystems. Aerial photography also is used to construct thematic maps that show the distribution of a variety of global resources.

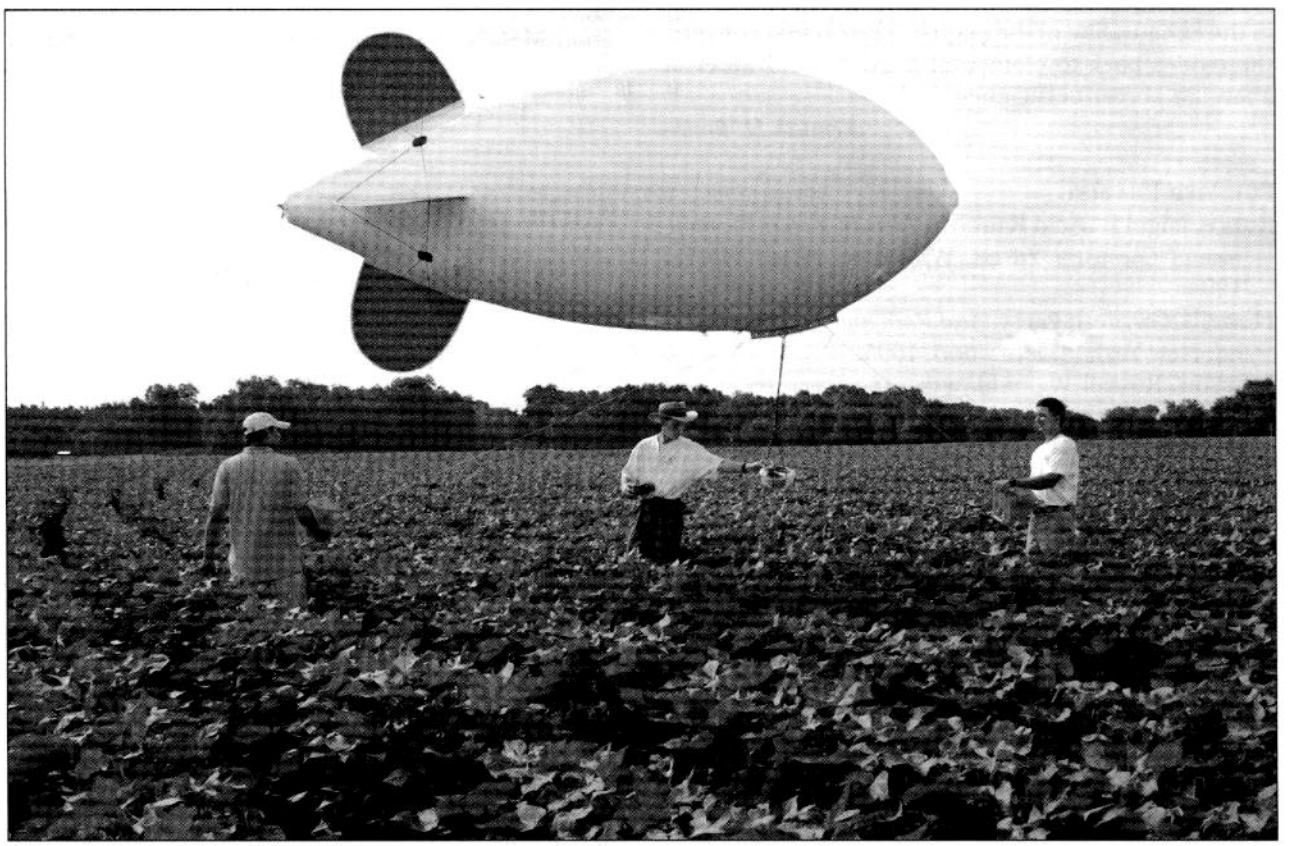
DEFINITION

Aerial photography is a form of remote sensing that relies on film or digital capture to acquire information about Earth's surface from elevated platforms. These platforms include balloons, airplanes, and satellites. The primary advantage of aerial photography over ground-based observations is the elevated vantage point, which can provide images covering vast expanses of Earth's surface.

OVERVIEW

The invention of photography was announced in 1839 at the joint meeting of the Academies of Sciences and Fine Arts in Paris, France. Nineteen years later, in 1858, Gaspard-Nadar Félix Tournachon made the first aerial photograph from a tethered balloon over Val de Bièvre, France. The oldest extant aerial photograph dates to 1860, when James Wallace Black photographed Boston, Massachusetts, from a balloon tethered above Boston Common. The first aerial photograph made from an airplane was in 1908; the first aerial photograph made from a satellite was in 1959. In the twenty-first century, aerial photography is a vital tool for documenting and managing Earth's resources.

In order to obtain quantitative information about the Earth's resources from an aerial photograph, methods must be applied to the photograph that allow for reliable estimates of spatial relationships. Obtaining such relationships falls under the broad field of photogrammetry. By applying photogrammetric methods, analysts can relate distances on the photograph to distances on the ground. Object heights and terrain elevations can be obtained by comparing photographs made from two different vantage points, each with a different line of sight. This method is based on the principle of parallax, wherein the apparent change in relative position of stationary objects is compared between the photographs. Additional information can be gleaned from aerial photographs by examining tonal changes and shadow distributions within the photograph. Tonal changes can provide information on texture, which can be used to distinguish between vegetation type, soil type, and other surface features. Because the shapes of shadows change with time of day and are unique to particular objects, such as bridges, trees, and buildings, the shadows can be used to aid in the identification of the objects. Because film can record wavelengths of radiation that are invisible to the eye, such as thermal infrared radiation, features such as plant canopy tempera-



University of Georgia researchers rely on a farm blimp to provide aerial images in their quest to detect drought stress in cotton fields. (AP/Wide World Photos)

ture can be measured and displayed on an aerial photograph.

Aerial photography has many applications, including geologic and soil mapping, agricultural crop management, forest monitoring and management, rangeland management, water pollution detection, water resource management, and urban and regional planning. In geologic mapping, for example, aerial photography can be used to identify faults and fractures in Earth's surface as well as rock and soil types. By comparing these features over time, scientists can make inferences about the forcing agents, such as wind and water, that have shaped the land. As world population grows and demand for global resources increases, aerial photography will continue to be an important tool for guiding global resource management.

Terrence R. Nathan

SEE ALSO: Conservation; Environmental engineering; Geology; Irrigation; Land management; Land-use planning; Rain forests; U.S. Geological Survey; Wind energy.