

RESOURCE NOTES

NO. 20

DATE 06/27/00

The Use of Aerial Photography and Historical Records to Assist Land Managers

By Michael Marchase, Cartographer, National Science and Technology Center, BLM

Background

Important changes on public lands can be assessed and quantified using state of the art photogrammetric and image processing methods. Information can be gathered and structured to address many questions using records (diagrams, plats, sketches, maps) and historical and current aerial photography. Some such questions may deal with ownership and title (especially where rivers are involved), still others are driven by oil and gas royalty distributions while others may be concerned with liability issues. The Bureau of Land Management's National Science and Technology Center has been involved in applying photogrammetric and image processing methods on a number of projects. The results of using these methods and technologies have been very beneficial to the Bureau both in time and money saved and quality and accuracy of the products.

Methodology

Capabilities of two disciplines, photogrammetry and image processing, have been combined to address issues of product cost,

quality, and accuracy. Photogrammetry, defined as the art and science of obtaining reliable information from photographs, provides the ability to interpret and measure ground features in a three dimensional (stereoscopic) environment. Because of the ability to use elevation differences when interpreting features, stereoscopic viewing produces a more reliable and accurate data set. Image processing, defined as a section of remote sensing that encompasses all the various operations that can be applied to photographic or image data, allows you to resample, manipulate and otherwise conform the more conventional two dimensional data sets.

Following are some examples of types of issues where this technology can be of great value to land managers.

Riparian Boundary Investigation

Photogrammetry and image processing technology lends itself well to riparian boundary investigation, in support of cadastral survey operations. Typically these situations develop when a section of river is used as a boundary. Over time, the river has continued to migrate and lands adjacent to the river have changed title, resulting in ownership questions. Through diligent research of city, county, state and national archives as well as repositories and government agency records, valuable spatial information can be assembled. Using this historical data the rivers migration over time can be reconstructed and

chronicled. Placing all of the resulting information into a common coordinate system allows the Bureau's Cadastral Riparian Boundary Specialist to analyze the data and make decisions concerning land ownership based on laws and regulations that pertain to riparian property. These techniques have been applied on several projects at different spots along the Snake River in Idaho, on the Yakima River in Washington and on the Arkansas River in Oklahoma.

Investigation of Unauthorized Use and Right of Way Disputes

These techniques can also be used for situations involving unauthorized use or right of way disputes. Verifying a roads existence or detecting changes in alignment and conditions can be realized using historical aerial photography along with spatial records. Signs and gate locations, for example, can be determined if good quality source materials are available. The photographic record can fix events and land conditions in time and is therefore an excellent tool for use in litigation situations. These techniques have been applied on projects in Colorado, Utah and California.

Techniques and Tools

The preferred way of planning a project is to determine the end products needed and then develop the methodology that will deliver the desired results. With spatial data the accuracy and output scale are the most critical and controlling factors. With many of these types of projects however,

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output accuracy and scale depend on the accuracy and scale of the historical source material one is able to locate. When relying on historical material, the controlling factor is what is available and will it meet the project requirements.

For some projects, aerial photography flown via the National Aerial Photography Program (NAPP, 1:40,000 Scale) and ground control derived from U.S. Geological Survey Digital Raster

Graphics (DRG) with a horizontal accuracy of +/- 40 feet and a vertical accuracy of +/- 5 feet may satisfy the necessary accuracy. For projects with higher accuracy requirements, meeting specifications may require "on-the-ground" surveying with a higher accuracy and new photography flown at a larger scale.

On a typical project of this nature, current or recent photography that has a ground control

survey associated with it, is desired. Once this is obtained, the control (known x,y,z coordinates) can be bridged to different years of photography, and/or to historical records (maps, plots, sketches, diagrams) if common locations can be determined. Given this situation the compilation can be performed whether you are looking for the Ordinary High Water Line of a river or the edges of a road or quarry.

Tools that are used when dealing with these kinds of projects are: document scanners, photogrammetric scanners, analytical stereoplotters, image processing software, compilation software and printers.



Contact

Michael A. Marchase
Cartographer
BLM, NSTC
Denver Federal Center
Building 50
P.O. Box 25047
Denver, Colorado 80225-00476,
phone (303) 236-1738
fax (303) 236-6564
email: Michael_Marchase@blm.gov



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