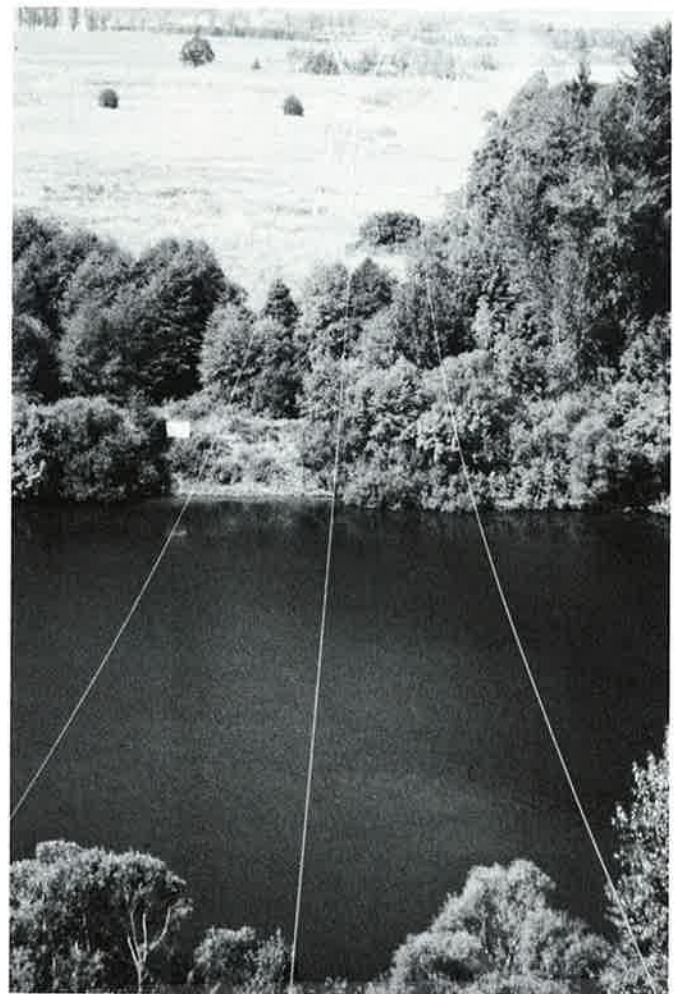


Use of Low-level Photography to Manage Transmission Line Rights-of-Way

by Joe A. Johnson



Joe Johnson has worked for the last ten years as Right-of-Way Management Specialist for the Bonneville Power Administration in Portland, Oregon. Johnson has a bachelor of science degree in forestry from the Stephen F. Austin State University in Texas.

He has developed an audio-visual presentation of the photographic methods described in this article. It has been presented at the following locations:

1. *The Third Symposium on Environmental Concerns in Rights-of-Way Management* — Feb. 15-18, 1982 in San Diego, California.
2. *Edison Electric Institute Fourth National Conference on Land Use, Recreation, and Resource Management* — August 9-12, 1982 in Duluth, Minnesota.
3. *Annual Educational Seminar of Chapter Three International Rights-of-Way Association* — November 4-5, 1982, Wilsonville, Oregon.

As early as 1973, BPA began to experiment with the use of aerial photography to identify maintenance problems on powerline rights-of-way. At that time, the commercially available aerial product was low-level color strip transparencies taken from a camera mounted horizontally in a fixed-wing aircraft. The resulting photography recorded what was behind the aircraft, rather than what was ahead. The photography was accompanied by a tape, narrating conditions on the rights-of-way.

Due to performance and contracting problems, BPA soon became interested in developing a more reli-

able system. Early efforts consisted of simply taking photographs of the right-of-way from a helicopter with a hand-held camera, then taping the rolls of exposed film together to form strip photography. Beginning with the purchase of a motorized camera in 1974, BPA has since developed a unique and sophisticated system which serves a variety of purposes resulting in significant dollar and manpower savings. Our present system produces continuous color strip photography of every powerline in the BPA system. The color transparency strips can be mounted on reels and conveniently

viewed in any office on a Dukane Model 27A25 viewer. The low-level photography displays the type of vegetation on the rights-of-way, as well as buildings, gardens, streams, or other bodies of water, gates, etc.

Originally, the low-level photography system was designed to identify areas beneath powerlines where brush control was needed. Typically, photography is used during the winter season to review the rights-of-way and select areas for contract brush control in the Spring. The low-level photography is used in conjunction with a Plan and Profile (P&P)* and high-altitude photography** to produce detailed instruction for the contractor. If necessary, the instructions produced with these aids can specify accurate locations and detailed prescriptions for very small tracts.

Although originally developed for use in the brush control program, low-level photography has become an integral part of many BPA planning processes and activities. In addition to its use in developing site specific vegetation management prescription, it is also used for work planning, (e.g., scheduling brush crews), and to identify access routes and appropriate equipment, to identify potential danger trees, to check the condition of access roads, including necessary erosion control measures or to forecast or modify road improvement contracts, to locate noxious weeds, or to verify office records for brush control or other right-of-way activities. Low-level photography has also demonstrated its utility in locating new lines or access roads, line revisions or line taps. Preliminary review of the low-level photography is helpful prior to field activities, such as timber cruising or land surveying. It can also be used to verify the type of structure presently on a right-of-way or the need for airway marker balls, airway lighting, or other

* A Plan and Profile (P&P) is a drawing illustrating topographic features, land use patterns, ownership, and major features of the existing electrical system.

** High altitude photography can be used to locate major features such as powerlines and access roads. In this example, it functions as a sort of photographic map.

installation details associated with various structures. In emergencies, such as unanticipated outages, low-level photography is helpful for planning the appropriate corrective actions. For those unfamiliar with an area, such as new foremen or contractors, the low-level photography provides essential background information. An unexpected use for low-level photography has been as a resource in responding to public or landowner complaints. Use of low-level photography to verify a complaint or check a description of a situation has enabled us to respond more promptly to problem situations. All of the uses described above have resulted in a savings of dollars, manpower, or travel expenses, and, in some cases, improved BPA's ability to respond to public or landowner concerns.

Low-level photography is used in conjunction with a computer based data storage and retrieval system (ROWDATA). Together, low-level photography and the computer based data system form the basis for site specific vegetation management prescriptions, and a historical record.

The present BPA photography system uses a Nikon F2AS camera with the following accessories:

- 85MM F-2.0 Lens
- 250 exposure back
- MD-2 motor drive
- 52MM polarizing filter
- Control attachment DS-1
- EE aperture servo
- Pistol grip with electrical connecting cable

Additional accessories used with this system include:

- 250 exposure film cassettes
- Bulk film cassette loader
- Bungi cords for hanging camera in helicopter
- Battery chargers for rechargeable batteries
- 35MM film splicer

The camera is mounted in a Bell 206 Jet Ranger. The only alteration to the aircraft is installation of a set of two small hooks placed on the passenger side where the fuselage connects with the windshield. Flights are made 25-50 feet above the conductor (approximately 100

EXPERIENCE, RESPONSIBILITY

COATES FIELD SERVICE

CONSULTANTS

- Right of Way and Land Acquisition.
- Damage Claim Settlement.
- Oil, Gas, Coal and other Mineral Lease Acquisition.
- Title Search and Document Preparation.
- Right of Way Evaluation Studies.
- Crossing Permit Acquisition.
- Municipal Water and Sewer Projects.
- Appraisals.

SPECIAL SERVICES

- Route Selection Studies.
- Investigation and Acquisition of Microwave, Power Generating, Industrial and Other Plant Sites.
- Relocation Assistance.

DIVISION OFFICES:

**Albany, New York
Houston, Texas
and Seattle, Wash.**



COATES
FIELD SERVICE, INC.

CALL: A/C 405 528-5676

WRITE: P.O. BOX 25277

OKLAHOMA CITY 73125

(An Equal Opportunity Employer)

**COATES FIELD SERVICE,
CANADA LTD.**

CALL: A/C 604 584-7227

WRITE: 14651 108TH AVENUE

SURREY, B.C., CANADA

V3R 1V9

feet above the ground, depending upon the height of the conductor). Our ideal flying speed is 90 mph, but speed may range from 90-110 mph depending upon the amount of light available. Because the polarizing filter reduces light by approximately 2½ times, light must be bright enough to shoot at a minimum of 1/250 second. On a bright day, 1/500 second is recommended. Photography is taken while flying down the center conductor, photographing ahead on line. Each line is photographed individually, even where there are multiple lines on a right-of-way. Best results are achieved by leaning into the camera to absorb as much vibration as possible. Each mile marker (located on top of first tower in each mile) is photographed separately, making additional numbering of the photographs unnecessary. Generally, one exposure is required for each tower, and one exposure for the area between spans. Photography should be scheduled for a season when the leaves are still on the hardwoods. Time of day may also be important to reduce shadows. For south running lines, photographing at noon time avoids the long shadows cast by trees on the side of the right-of-way in the morning. Again for south running lines, overcast skies are desirable to avoid flying directly into the sun. When photography is complete, the film is developed, edited, spliced, and mounted on 100-foot plastic spools. Film can be viewed on a Dukane Model No. 27A25 viewer. Approximately 75-90 miles of right-of-way photography is contained on a 100-foot roll of film (mileage is slightly higher for steel structure lines than wood pole lines.) An average of 250-300 miles of photography can be taken in a single day, using the system described above. This system requires only two people, the pilot and a photographer. Our photographer is a right-of-way maintenance specialist.

The following are three actual examples of use of the low-level photography system, which illustrate its flexibility. The first case study uses the low-level

photography system for right-of-way brush control. The second case study uses the low-level photography as protection against damage claims, and the third case study involves using the low-level photography to coordinate a cooperative work project.

Case Study #1

The first case study uses low-level photography for brush control on the right-of-way. Low-level photography is taken the summer before a prospective treatment. During the winter, the photography is reviewed to locate spots of heavy brush. Although heavy brush potential areas are identified in our computerized inventory system, actual growth and field conditions are reviewed on the photography. The low-level photography has also been used for initially inventorying the characteristics for all rights-of-way for our computer inventory system, and provides the initial data for developing the site specific brush control prescriptions. We can also identify the areas that need control.

Once the areas requiring control have been identified, a contract, "detail sheets," or working instructions for brush control activities can be developed. If brush control is to be performed by a contractor, a contract is released. Prospective bidders can review the areas for control, both on the ground, and through the use of the low-level photography to develop their cost estimates ("bids"). When the bids have been submitted, the contract can be awarded and the control project implemented. Whether the work has been completed by contract, or by our own crews, the low-level photography again becomes useful. Low-level photography taken after treatment serves as a pictorial record to determine what work has been accomplished. The strip photography is especially efficient for showing skips and misses during aerial helicopter spraying and can serve as a record to document herbicide drift, in the event a claim is made. The photography could also serve as the basis for payment (or non-payment as the case may be) for a contractor.

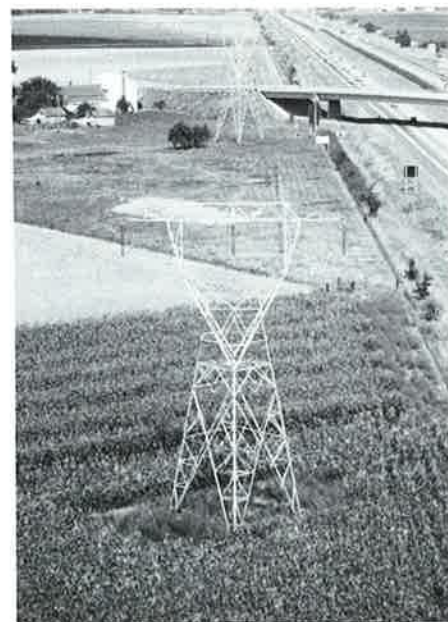
Case Study #2

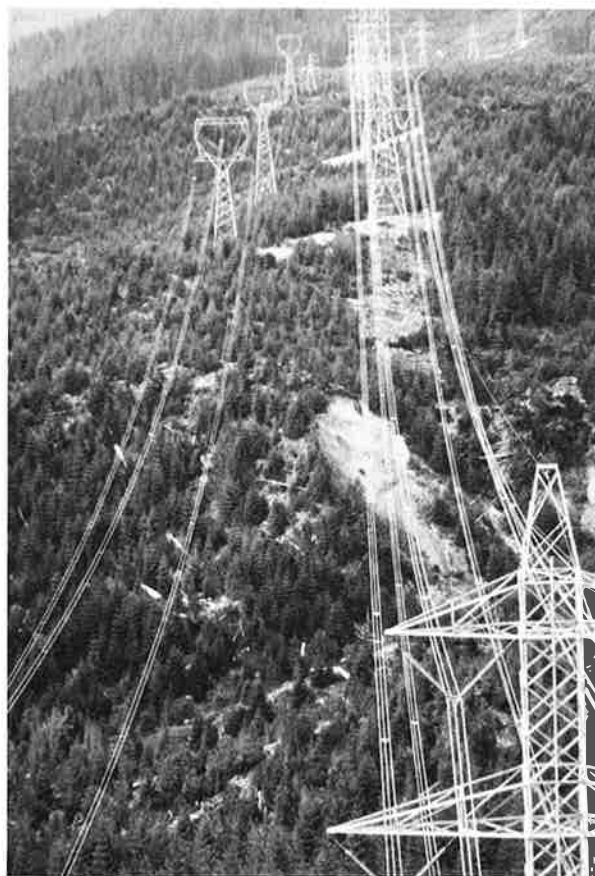
Our second case study uses low-level photography of a construction project to protect BPA against unfounded damage claims. In this case a new high voltage transmission line was built across prime agricultural lands. Low-level photography of the right-of-way was taken after construction had been completed, both during the crop growing season and immediately after harvest. The photography served as a record of damages sustained by farmers as the result of either BPA activities or other causes. The photography has subsequently been used in damage claims currently pending resolution.

Case Study #3

In the third and last case study, low-level photography was used to coordinate various aspects of a cooperative transmission line construction project. This project also involved new construction of a tap line which was to incorporate an existing line owned by a private utility. Low-level photography was taken prior to beginning the project. In this case, the strip photography not only documented existing conditions but was timed to show high water levels and drainage patterns to facilitate planning and design. The new line will be completed in several successive stages. Since each stage will be completed by a different cooperator

Case Study #2





(i.e. a different utility) in the project, photographic records will be taken after each construction stage is completed. The photography again serves as a permanent photographic record, and will be exceptionally helpful in reducing ground and helicopter surveys.

In closing, I would like to summarize our experience with low-level photography by simply repeating that it has evolved from a limited right-of-way vegetation management tool to a multi-purpose aid for planning and executing nearly all phases of a transmission line from construction through maintenance.

Advertise in RIGHT OF WAY

For as little as \$75.00, your message will reach over 10,000 proud professionals dedicated to the responsible growth and development of North America. Call 213-649-5323 today for more information.



THE RIGHT-OF-WAY SPECIALISTS

for more than 50 years

**Ford,
Bacon
& Davis**
Engineers
Constructors

For complete
Right-of-Way Services
Call
(318) 388-1530
Monroe, LA

Dallas • Salt Lake City •
Birmingham