

Soleduck (continued)

and slow-growing, usually woody species that cannot easily be propagated by seed. To increase diversity, the crew attempted to transplant any species not previously encountered.

In August, the emphasis began shifting from plant salvage to seed collection. Seed from 24 species was collected and cleaned. Because maximum diversity was desired, an effort was made to collect each species from a variety of locations and habitat types. Early and late ripening fruits of the same species were collected. Seed from tall and short individuals of the same species was sought.

The collected seed will be propagated in a number of ways. A contract is being negotiated to have 8,500 salal plants and seedlings of other species grown from Soleduck Valley seed by a commercial nursery. Three species will be tested and grown for production by a local high school horticulture class. Ten species are being used in field germination test plots on cut slopes on the neighboring forest service road. The project staff will use the remainder for additional germination tests and fall-sowing for production.

Propagation from cuttings has also been attempted. In April 1986, hardwood cuttings were taken from 10 woody species. They were planted and are being cared for under contract by Diversified Industries, a local sheltered workshop. Species that rooted and showed over 50 percent survival include flowering currant (*Ribes spp.*), Snowberry (*Symphoricarpos albus*), and dogwood (*Cornus stolonifera*). Over 20 percent of Thimbleberry (*Rubus parviflorus*) and Salmonberry (*Rubus spectabilis*) cuttings survived. In August, more than 2,100 semi-hardwood cuttings representing six species were collected and are being cared for under mist in polypropylene tents.

As work progressed, records were kept on the time and costs needed to salvage or propagate native genetic stock. In the case of sword fern, an important community dominant, salvage appears to be clearly cost effective. Sword fern purchased for visitor center plantings cost \$9 per two gallon container for plants in excellent condition. The cost of salvaging a large sword fern with a good root ball was between \$.85 and \$.39 a plant. Even if the cost of a container were added, this would still be a considerable saving. As previously noted, transplant survival is at least 95 percent and all plants are from the Soleduck gene pools. Preliminary figures suggest that, for a number of species, salvaging local genetic stock can save money, if a particular species transplants easily. The cost of growing natives from seed is also reasonable. Year-old containerized evergreen seedlings can be grown by contract for around \$125 per thousand. Year-old woody shrub seedlings such as salal in 4 to 10 cubic inch containers are estimated to cost about \$.62 per plant not including the cost of collecting local seed. Whatever method is selected, the importance of adequate time for planning and preparing a revegetation project is critical. Although some species can be contract grown in a year's time, at least two years lead time is recommended.

During the 1986 field season, work with slope preparation and native plant materials laid the ground work for achieving the project's visual quality goals. The staff found that much of this work could be done in ways that consider the genetic integrity of the ecosystem, but do not generate excessive additional costs. As work proceeds and more results are available, we hope that the standards we test will be useful to future road projects in the National Park system and beyond.

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Using 35mm Color Infrared Slides To Map Vegetation

By Alison Teetor

Vegetation maps are becoming an increasingly important tool in resource management. Development of these maps often involves manual interpretation of aerial imagery in conjunction with ground work to verify the actual forest cover. Using stereoscopic pairs of 9" x 9" photographs has been the standard technique, but a new approach, developed by the Virginia Commission of Game and Inland Fisheries (VCGIF) utilizes 35mm color infrared (CIR) slides. Shenandoah National Park (SNP) began mapping its 195,000 acre land area in 1983. Slides were chosen because the overall cost was substantially lower than other available aerial imagery. As of January 1986, two-thirds of the park had been mapped using CIR slides, field checked, and tested for accuracy. This article describes the methods, advantages, and disadvantages of using this technique.

Study Area and Methods

Shenandoah National Park is located in the Blue Ridge Mountains of Virginia. The park contracted with the VCGIF to obtain CIR imagery over a three year period. Approximately 3500 slides were required to provide complete coverage. Slides had the standard 60 percent overlap and 30 percent sidelap, and covered about 430 acres each. As with photographic imagery, reflights are often necessary as complete overlap is difficult to obtain with one flight and gap areas cannot be identified until after the area has been mapped. Total cost of the slides was \$8700.00. Table 1 outlines the costs of obtaining CIR slides compared to 9" x 9" photos.

The CIR slide method of vegetation mapping involves several steps. The imagery must be obtained, the slides are then interpreted, and draft maps are produced. The maps are verified on the ground by extensive plot sampling, rechecked, and corrected. Finally, the maps are tested for accuracy.

A plane, pilot, photographer, and camera equipment, essential for obtaining aerial imagery, may be available through other federal or state agencies doing aerial photography in the area. Often, however, this service must be contracted to private aviation companies specializing in aerial photography. The plane used must be equipped with a camera port in the bottom of the fuselage, and a special photo platform manufactured to hold the camera. For large land areas, the camera system must be capable of taking 250 pictures/roll of film with an electric timer calibrated to the speed of the aircraft to obtain the desired exposure sequence, (usually, 8-10 frames/minute) depending on airplane speed, altitude, camera equipment, and desired overlap (Martin, 1982).

The basic equipment needed to interpret slides is a slide projector and viewing stand (Fig. 1). The slides are projected to the ground glass screen. A mylar film with the topographic features covers the screen, and the slide is aligned to the topography. Forest stand boundaries are delineated directly onto an additional mylar sheet positioned over the topographic sheet. The viewing stand was adapted by the VCGIF from a projection system developed at the University of Minnesota (Meyer, 1978). With the specialized glass plate, its cost is approximately \$150.00. Information regarding the construction of a viewing stand may be had by writing the author.

Identifying Forest Cover Types

The slides were taken at an average altitude of one mile above ground level. This provided imagery that could be interpreted at a 1:12,000 scale. A minimum stand size of 3-5 acres was established since this was the smallest area that could be accurately identified. It was also determined that only the central portion (65%) of the slide could be evaluated to avoid extensive scale distortion caused by changes in ground elevation.

The range of scale for 35mm slides runs from 1:600 to 1:20,000. The larger scale enhances detail while the smaller scale provides complete coverage with fewer numbers of slides.

Results

The forest cover of SNP is representative of the eastern deciduous forest community. This forest type is one of the most diverse in the United States. To

Table 1. Cost comparison for obtaining 35mm CIR slides versus 9" x 9" photos, for the 195,000 acres of Shenandoah National Park, VA. 1986.

ITEM	35mm SLIDES	PHOTOGRAPHS
Film Processing & Handling	CIR Film - Special Factory Order Eastman Kodak Co., Rochester, N.Y. Catalog no. 152-5203 Aerochrome Infrared Film 2243 Estar Base - 135mm 150 foot rolls - \$72.48/roll 45 rolls TOTAL \$3300.00	False Color Infrared Title negatives TOTAL \$1404.00
Airplane & Pilot Rental	Based on an average Park dimension of 105 x 10 miles Approximately 10 flight lines 18 hours at \$55.00/hour TOTAL \$3950.00	Same average dimension and flight lines TOTAL \$13,660.00
Film Processing & Handling	Lightwork Lab 509 NW 10th Avenue Gainesville, Florida 32601 \$30.00/roll mounting and handling not included, 3500 slides TOTAL 45 ROLLS \$1450.00	One set 9" x 9" transparencies 1404 exposures TOTAL \$8424.00
	TOTAL \$8700.00	TOTAL \$23,488.00

Infrared Slides (continued)

date, two-thirds of the park has been mapped using CIR slides, and seven dominant cover types were accurately identified an average of 70 percent of the time (Garner and Vaughan, 1985, Teetor, 1985). Delineation of forest cover types is based on slide color, texture, and knowledge of where individual cover types are likely to occur relative to site conditions (Garner, et. al., 1983). Extensive field verification is a necessary component of this method and about half of the stands outlined were visited on the ground. The remaining 65,000 acres was mapped during the summer of 1986. The project completion date is May, 1987.

Advantages

The most obvious advantage of using slides is cost efficiency. Not only is the cost of acquiring the slides much lower than for the 9" x 9" photos, equipment used to interpret the slides is less expensive. This relatively low cost allows imagery to be taken more frequently to provide a better record of forest cover defoliation, recreational development, and land management practices over time. In SNP, slides were taken in the summer to evaluate the dominant canopy coverage and during the winter to evaluate evergreen understory distribution. In addition, small land areas (<100 acres in size), such as unique natural features can be mapped using CIR slides, in these instances the imagery is easily acquired and interpreted by land managers.

Disadvantages

The use of slides involves some reduction in detail, since the projected slide has a surface area of about 4" x 6" compared to the 9" x 9" photo. Although 35mm cameras are capable of producing photography, there is a sacrifice in definition that goes with using smaller camera equipment and large areas would be difficult. Detail is reduced in the slide methodology, which is incapable of 3-D interpretation, compared to the stereoscope capability which also can magnify the 9" x 9" photographs to 2 to 6 times their original size. Distortion is a potential problem, but this is also a problem with photos. The set up used to interpret the slides requires that the projector be manually manipulated to correct the scale . . . a somewhat tedious procedure but one that does effectively eliminate scale distortion. Another problem in using CIR slides is finding a place to have them processed (Martin, pers. comm.). Most film processing companies are not set up to handle the long roll length. SNP used a specialty lab in Florida. However, short rolls of 36 exposures may be developed in many locations. Costs for development are dependent on how the slides are mounted and handling fees.

Conclusion

CIR 35mm slides can provide an economical alternative to using stereoscopic 9" x 9" photos. Good quality slides provide an easy, efficient way to map large or small land areas without the costs of expensive equipment. Land managers will find this technique useful for interpreting vegetative cover, the effects of land management such as prescribed burns and land development, and the changes occurring as a result of insect defoliation.

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Garner, N.P., A. Teetor, and M.R. Vaughan. 1983. *Seasonal habitat use and home range of black bears in Shenandoah National Park. Progress Report (Habitat mapping). September 1983. 17 pp.*

letters to the editor

To the Editor:

The National Park System Advisory Board's September 1986 "Report on 'Overcrowding' in the National Parks" does not pretend to be a scientific document, but its treatment of science is most unsettling. The report correctly points out that many problems can be mitigated by redesign and/or alteration of visitation patterns and that raw numbers of visitors do not necessarily constitute overcrowding from a sociological or ecological perspective. Furthermore, the report notes that increased staff and knowledge can be utilized to reduce visitor impacts.

However, the report is seriously flawed. It is instilled with logical defects and substantive omissions that cast doubt upon its objectivity. It states that overcrowding is imprecisely definable and is "based on individual perspective and varies with location." It goes further to state that "little if any data exist to indicate the effects of public use on natural and other resources." How is it that the Board can act (or base conclusions) upon assessments of an assertedly undefinable concept; one that in its own judgment, has been only superficially studied? The Board does so by reducing the park environment to the physical tourist facilities provided to accommodate visitors; and by claiming ignorance of the body of literature that relates human influence to park ecosystems.

This is totally unacceptable and is a direct affront upon the principal mission of the National Park Service. The statement that "except in extreme, dramatic cases, the use of 'carrying capacity' as a scientific justification for imposing restrictions on visitor use will

probably not be widely accepted by park users in the near future" is blasphemous (neither is it likely that the Bill of Rights could pass a plebiscite). The National Park Service has a clear mandate "to conserve the scenery and objects" it stewards. Use must be congruent with that objective. We cannot ignore demonstrated use/impact relationships, nor where suspected, fail to conduct inquiries to determine their extent.

It is more accurate to state that park managers, when confronted with scientific data on the relationship between visitor use and impact are hesitant, unwilling or unable to make the hard decisions necessary to protect park resources because of external political considerations than to say that the data upon which to base such decisions do not exist.

Science can only rarely tell a manager how much is too much. However it can often paint a good picture of the influences of his actions (or inactions) on the resource.

The Advisory Board must broaden its perspective for its findings to become valuable contributions to the many questions at hand.

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Editor's Note: The NPS Advisory Board Report referred to here appears in its entirety in the current issue of the George Wright Society FORUM (Vol. V No. 2).

Garner, N.P. and M.R. Vaughan. 1985. *Seasonal habitat use and home range of black bears in Shenandoah National Park. Progress Report (Habitat mapping). May 1985. 12 pp.*

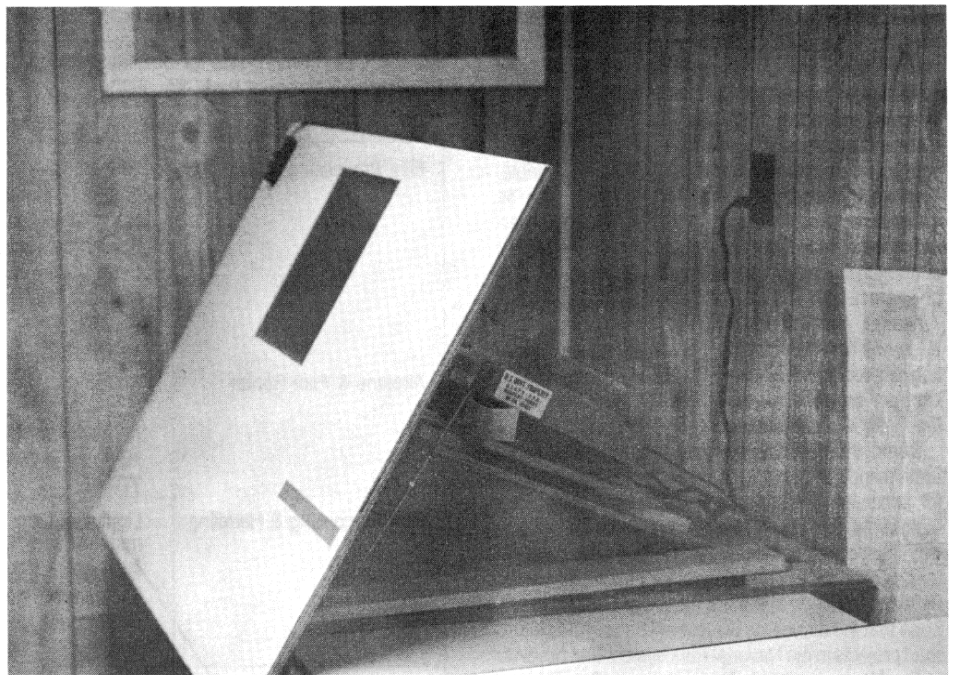
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Viewing table used to interpret color infrared slides for vegetation mapping at Shenandoah National Park.