Harry F. Lins, Jr.
U.S. Geological Survey
Reston, VA 22092

Some Legal Considerations in Remote Sensing

The admissibility of remote sensing evidence, and the impact of remote sensing technology on privacy and international regulation, are discussed.

Abstract: *The legal aspects of remote sensing technology have received little attention in the literature in comparison to the research and applied aspects of the field. The need for understanding the legal implications of remotely sensed data usage is, however, no less significant. From a legal perspective, the consideration of remotely sensed data in litigation is founded in the rules regarding evidence. The criteria governing the admissibility of remote sensing evidence are (1) reliability of remote sensing techniques, (2) proper conduct of the remote sensing process, (3) authentication and proof of contents, and (4) expert testimony.*

Remote sensing technology is beginning to impact certain subjects which are somewhat ill-defined legally. These include privacy and international regulation. While political and social trends indicate a growing interest in the protection of privacy, neither the U.S. Constitution nor any of the State constitutions explicitly guarantee a right of privacy. Also, with the launching of the Landsat series of spacecraft, a number of nations have voiced concern about possible disadvantages resulting from world-wide distribution of data about their territories.

Introduction

The environmental movement, both philosophic and legislative, has presented the courts of this country with a new and interesting challenge. Through their recent evolution, federal air- and water-quality legislation, as well as waste- and land-management statutes, have given added responsibilities to the courts. Despite the fact that more stringent and well-defined legislative controls have been levied by the Federal government since the mid-1960s, the laws regarding the admissibility of various types of evidence have not advanced commensurate with these controls.

The purpose of this paper is to introduce to users of remotely sensed data some of the legal aspects of these data and their uses. Ever-broadening applications are being made of remotely sensed data, and their legal significance is increasing accordingly. This places considerable responsibility on users of remotely sensed data in a problem-solving capacity. These specialists are occasionally called into a court of law to explain the contents and accuracy of such data. Therefore, all compilers and users of remotely sensed data should be familiar with the basic and current legal concepts regarding the judicial review of these data, and with developing trends which may change these current concepts.

In addition to use as adjudicatory evidence, remotely sensed data have other legally significant applications. One is in environmental management, another is statutory enforcement. Regarding environmental

Photogrammetric Engineering and Remote Sensing,
Vol. 45, No. 6, June 1979, pp. 741-748.

management, remotely sensed data have gained widespread acceptance as a result of their value in producing economical and timely coverage of large areas of the nation. With most major environmental and natural resources programs (e.g., the National Environmental Policy Act [NEPA], Clean Air Act, Coastal Zone Management Act) that require comprehensive long-term planning and the development of area-wide standards for environmental quality, broad multidisciplinary information bases are needed. Remote sensing techniques currently provide the most efficient means of providing such data.

With respect to statutory enforcement, remotely sensed data are primarily aimed at the preliminary detection of violations of existing standards. The data also are useful in identifying changed or irregular environmental conditions, thereby providing regulatory agencies with a method for setting priorities and allocating investigatory resources. Where remote sensing techniques have provided information used in the development of a regulatory standard, similar techniques may subsequently be employed to detect possible transgressions of that standard (Latin *et al.*, 1976).

Evidentiary Applications

The two forms of evidence most applicable to cases involving remotely sensed data are demonstrative evidence (the actual data themselves) and testimonial evidence (interpretation of the data by an expert witness).

In general, demonstrative evidence consists of tangible items such as bullets, knives, diamond rings, etc., submitted for inspection, which enable the judge and jury, by the direct use of their senses, to perceive facts about these things in evidence. Documents such as business records, maps, models, photographs, and demonstrations are also forms of this type of evidence. The admissibility of such evidence is usually predicated on the condition that it be identified by a witness as a portrayal of certain facts relevant to the issue, and verified by such a witness on personal knowledge as correctly representing these facts (McCormick, 1972). In the use of photographs, for example, a complete record should be available of when and where the photo was taken, under what conditions, and possible distortions (Chernoff and Sarbin, 1971).

Unfortunately, the judicial rules regarding the admissibility of photographs do not relate well to all forms of remotely sensed data. A more correlative condition exists in the use of x-ray materials. For example, x-ray films, to be admissible, require a higher degree of authentication than do photographs, since x-rays can be taken, and in most instances accurately read, only by experts. Furthermore, for an x-ray film to be sufficiently authenticated, evidence must be presented that it was taken by a properly qualified expert who is familiar with x-ray technique and procedure, and is a true representation of what it purports to show. The sufficiency of authentication is left largely to the discretion of the trial judge. This indicates that the more conventional forms of remotely sensed data, aerial photographs for example, would be more easily admitted as evidence. In fact, aerial photographs have been admissible in many cases; in many other cases, however, these data have been judged legally inadequate. The courts required more "quantitative information" than that provided by the remote sensing systems used (Rouse *et al.*, 1972).

The second form, testimonial evidence, has more consistent rules regarding its application than does demonstrative evidence. The requirements for an expert witness are presented in the recently adopted Federal Rules of Evidence (Redden and Saltzburg, 1975) which state that, if "scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact of issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise.

The question of whether a person qualifies as an expert in a particular field is a matter for the discretion of the trial judge. For this reason, and also to enhance the credibility of their expert in the eyes of a jury, most lawyers chose to select over-qualified witnesses (Sullivan and Roberts, 1975). It is not essential, however, that the witness be a scholar or specialist in his field. McCormick (1972) notes that "the knowledge may in some fields be derived from reading alone, in some from practice alone, or as is more commonly the case, from both. While the court may rule that a certain subject of inquiry requires that a member of a given profession, such as a doctor, an engineer, or a chemist, be called, usually a specialist in a particular branch within the profession will not be required."

Currently, the large majority of remote sensing investigators do not possess academic degrees in remote sensing. On the one hand, there are scientists who were initially trained in traditional disciplines such as geography, biology, hydrology, geology,

or forestry and who subsequently developed an understanding of remote sensing technology because it is applicable to their respective fields of study. On the other hand, scientists with backgrounds in such fields as physics, engineering, or aeronautics, which provided them with a knowledge of the physical principles underlying the sensing technology itself, have developed competence in remote sensing instrumentation and technological applications. Because of these different backgrounds, a number of alternative methods have been used in litigation to document the professional qualifications of potential expert witnesses. The factors considered include the exposure of the witnesses to some formal education in the technology, familiarity with the professional literature, publications directly on the matter at issue or on related subjects, membership in relevant professional societies, professional recognition, past and present occupational responsibilities, and, above all, demonstrated experience in the collection and interpretation of remotely sensed data. Such methods of proof correspond with those generally employed to establish the competence of experts in technical disciplines that do not have a prescribed course of instruction or a mechanism for professional accreditation (Latin *et al.*, 1976).

The utility and functions of expert witnesses come in two stages, the pre-trial and the trial. In complex environmental litigation, the technical expert can fulfill a variety of important functions at the pre-trial stage. For example, through pre-trial consultations with his experts, the lawyer has time to effectively gather important technical facts. Similarly, bringing in the expert early in the proceedings gives the expert time to provide hard evidence, analyze the data already gathered, and make recommendations for further analysis. The sooner the expert imparts to the lawyer a thorough understanding of the problems in the case, the more successful the lawyer is likely to be in formulating and developing an effective trial strategy to implement in the courtroom (Sullivan and Roberts, 1975). Finally, through a pre-trial conference, the lawyer will assist the expert in the preparation of the expert's direct testimony. It is imperative that the expert witness present his facts and theories in very articulate and concrete language. Vague and unorganized testimony only serves to assist the opposition's attempts at discrediting the witness (Sive, 1970).

At the trial stage, the technical expert has two principal functions: (1) to give testimony interpreting the meaning of technological evidence for the benefit of the fact-finder (i.e., the judge and/or jury); and (2) to give technical advice to the trial lawyer, particularly during cross-examination of the other side's experts. Generally, the first of these is the more important. The outcome of an entire lawsuit may depend on the effectiveness of such testimony.

Environmental Management Applications

In the context of public policy, standards formulation, and area planning, remotely sensed data are becoming increasingly popular because of their economic value. Presently, Federal, state, and private organizations are using remotely sensed data for such purposes as rangeland and forest management, pollution monitoring and control, environmental mapping, and the monitoring of natural and man-induced coastal resource changes.

Information developed through remote sensing for environmental management applications will typically be introduced in legislative hearings or administrative rulemaking proceedings. Beyond the fundamental requirement that the data be relevant to the issues at hand, there are essentially no constraints upon the kinds of information that may be utilized in these dealings (McCormick, 1972). Legislative bodies are not obliged to hold public hearings or to elucidate on the factors evaluated in their formulation of public policy. Administrative agencies ordinarily are expected to solicit the views of interested parties, but are permitted considerable flexibility in fulfilling that mandate. Agencies may base decisions relating to legislative facts on their own determinations and expertise. Essentially, the only control placed on the introduction of remotely sensed data in this context is the decisionmaker's perception of its utility and reliability.

Latin *et al.* (1972) note several classes of management applications of remotely sensed data. One involves the monitoring of natural environmental conditions and the impact of human actions upon them. In the monitoring of water pollution, for example, remote sensing is efficiently used to assist in the assessment of such factors as regional water quality and specific pollutants, surface and subsurface phenomena influencing the dispersion of effluents, and large scale ecological degradation associated with water pollution. This application is designed to replace the sporadic and intermittent sampling procedures of the past with more economical methods capable of obtaining more com-

prehensive and current information. Such information provides environmental baselines against which subsequent changes can be identified and measured.

A second type of management application is that of inventorying resources. Remotely sensed data, in this context, can be used to produce accurate assessments of acreage, and perhaps estimations of the yields, of agricultural crops in the United States and the world. These data, in turn, are directly related to the consideration of such issues as farm-production quotas, agricultural price subsidies, and export policies. Similar inventory applications can apply to forest, wildlife, marine, and mineral resources.

A third class of remote sensing application in environmental management is the identification of natural phenomena that imperil or otherwise directly affect human activities. In response to dangers posed by floods, for example, Congress enacted the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Information on flood patterns and community susceptibility is a prerequisite for adequate flood control and disaster relief. The cost of ground surveys for floodplain mapping, estimated at $250 to $4,000 per square kilometre depending on the area, has prevented most localities from preparing the necessary flood hazard reports (Rango and Anderson, 1974). A number of studies have demonstrated the feasibility of using satellites to obtain floodplain mapping and inundation information.

A fourth management application of remotely sensed data, intended to produce information for use in legislative and rulemaking deliberations, is that of regional land-use planning and management. The desire to regulate the environmental consequences of development decisions and to resolve conflicts between alternative development strategies has led to the enactment of a variety of programs fostering planning and management practices on a broad geographic scale. Such programs include the Coastal Zone Management Act of 1972 and the Forest and Rangeland Renewable Resources Planning Act of 1974. The success of these and similar programs depends in part upon access to reliable information on current land-use patterns, on characteristics of the environment, and on human activities which make some future uses preferable to others. Conventional data collection techniques are often unable to supply adequate information at reasonable cost. The use of remotely sensed data, especially those acquired from spacecraft like Landsat, in land-use mapping has been demonstrated and in some cases implemented operationally. Remote sensing from space possesses two major advantages over ground surveys: (1) the cost of collecting information over large geographic areas is much lower, and (2) the imaging of the ground on successive orbital passes allows resource managers to monitor changes as they occur, thereby identifying development trends.

Although remotely sensed data collected for environmental management purposes are not primarily intended to serve as documentary evidence, the adequacy of such data could be tested in litigation. The preparation of Environmental Impact Statements (EIS), as mandated by the National Environmental Policy Act of 1969, serves as a good example. The courts have interpreted the environmental impact statement provision to require that a range of possible alternatives to any proposed action be considered, and that an EIS describe the environmental effects of the action on specific areas in light of local conditions. Both of these prescriptions—the potential alternatives and evaluation of local effects—greatly increase the volume of information that must be incorporated into the EIS process and, thereby, may increase the benefits to be obtained from the application of remote sensing technology. Since the sufficiency of an EIS is commonly challenged in court, remotely sensed data will undoubtedly receive closer scrutiny in the future as agencies increasingly rely on these data in the preparation of impact statements.

Another instance where remotely sensed data, collected for environmental management applications, may appear in litigation is in the documentation of baseline conditions. Maps and resource inventories compiled using remote sensing techniques are being used to identify changes in the environment, including unauthorized developments and ecological depredations (Latin *et al.*, 1976). In some cases, the imagery itself has been introduced in court to indicate the preexisting conditions, and then to quantify the changes between the time the baseline was established and the date of the litigation.

Enforcement Applications

Enforcement applications of remotely sensed data, like those in environmental management, are not primarily intended to produce evidence for use in litigation. Instead, they are designed to identify changed or irregular environmental conditions, and to

augment the investigative resources of regulatory agencies and other potential litigants. Both of these application categories require the periodic monitoring of very large areas. Unlike the management category, however, which is oriented toward the accumulation of general information about environmental features and trends, enforcement applications are directed at the initial detection of violations. Where remote sensing techniques have provided information relied upon to develop a regulatory standard, similar techniques may be employed to detect possible transgressions of that standard.

One organization which maintains an operational remote sensing program for enforcement purposes is the Environmental Protection Agency (EPA). Through the operation of its National Environmental Research Centers (NERC's), terrestrial, atmospheric, and aquatic pollutants are monitored using remote sensors aboard several aircraft (Felsher, 1972). The aircraft are well instrumented navigationally and carry photographic, thermal, and imaging radar sensors as well as a full complement of air sampling devices. Working in concert with the NERC's are two National Field Investigation Centers (NFIC's) located in Cincinnati and Denver. The mission of the NFIC's is to provide the EPA Office of Enforcement and General Counsel with a rapid response team of field investigators able to acquire evidentiary data for use in case preparation. As part of this team, the Denver NFIC has a laboratory for the analysis of photographs and remotely sensed imagery.

Some examples of enforcement undertaken by EPA and other Federal and State agencies include the detection of concealed effluent discharge outlets; the identification of air pollution sources either directly, through sensing the emission plumes, or indirectly, by imaging the resulting deterioration of nearby vegetation; the detection of illegal mining practices; the detection of irrigation violations; the monitoring of ocean dumping; and the identification of changes in land uses.

Any differentiation between enforcement applications of remotely sensed data and those developed to produce admissible evidence is unclear. The final decision to utilize remote sensing output as evidence depends not only on the technical characteristics and information content of the data, but also on the alternative investigational techniques available to an organization and on the degree of confidence in the data. As the technology becomes more familiar to the legal profession, the boundary between enforcement and evidentiary applications undoubtably will shift toward more frequent use of remotely sensed data as evidence. The distinction between these two applications, however, is unlikely to disappear completely. Some form of onsite inspection probably will be necessary in the prosecution of the vast majority of enforcement actions.

Privacy Considerations

At an ever increasing rate, photointerpreters are able to interpret, and photogrammetrists able to measure, all sorts of things on private property without the knowledge or consent of the owner. The legal limitations on this type of activity are not well defined, although recent decisions provide some guidance. For example, in an industrial espionage case involving the distribution of aerial photographs of a petrochemical plant construction site, a U.S. District Court of Appeals upheld a lower court ruling which prohibited the distribution of such photographs and the acquisition of any additional photographs. This case was not, however, explicitly based on privacy. Using a different approach, Jordan (1977) postulates that additional guidance may come from electronic eavesdropping laws which apply to similar technologies.

When one considers political and social trends, which indicate a growing interest in the protection of privacy, the question arises as to what the precise restrictions are on the use of remotely sensed data. Latham (1970) questioned whether restrictions could be found in administrative rules, and in statutory and common law. For example, at the Federal level the administration of aeronautical activities is vested in the Federal Aviation Administration (FAA). In most aerial photography operations, however, the Federal Aviation Regulations are not restrictive. The general orientation of all FAA regulations is toward air safety, and the question of land ownership (and, therefore, an individual's privacy) is not thought to be within their purview. This indicates that Federal administrative rules do not, in fact, place privacy restrictions on the acquisition of remotely sensed data.

Statutory law and common law are somewhat ill-defined concerning the subject. Neither the U.S. Constitution nor any of the state constitutions explicitly guarantee a right of privacy. The Fourth Amendment (search and seizure) and the Fifth Amend-

ment (due process), however, may be relevant in this matter. The United States Code does state the freedom of air navigation. In effect, the public is authorized to fly through airspace over private property; otherwise, the air belongs to the landowners. If an aggrieved party could show that a right of privacy exists and could prove that it had been invaded through the use of remote sensing, he probably could obtain redress from the courts. It appears, however, that damage claims for invasion of privacy would hinge less on the flying of the missions, or on the actual imagery, than on the use to which the information is put.

At the present time, those forms of remote sensing which have the greatest potential for successfully being held as violating an individual's right to privacy involve active remote sensors such as imaging radar and microwave systems. In this context, electronic eavesdropping laws may be applicable. Even if such a case reached the litigation stage, however, a counter-argument could conceivably be made maintaining that the atmosphere is full of similar background microwave transmissions. Proving a party guilty of such sophisticated eavesdropping could prove more challenging technologically than the actual eavesdropping itself.

To summarize, based on the above arguments, and the opinions of several attorneys with experience in remote sensing litigation, it does not appear that the acquisition and use of remotely sensed data could be upheld as constituting an invasion of an individual's privacy in a court of law. Although arguments could be brought against the acquisition and use of these data, such arguments would have to be based on grounds other than privacy, for which an established legal precedent exists.

International Regulation Considerations

With the launching of Landsat 1 and 2, and the subsequent acquisition of multispectral data from those spacecraft, several nations have become seriously concerned about the right of one nation to remotely assess the resources of another nation, and to disseminate such data on an unrestricted basis. This concern has generated a number of specific proposals for comprehensive international regulation of remote sensing from outer space, which are currently under review by the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (Stowe, 1976; Stowe, 1978).

Brazil and Argentina, for example, have jointly proposed a draft treaty which provides that (1) remote sensing of another country's natural resources may not be undertaken without that country's prior consent; (2) data relating to the natural resources of one state cannot be disseminated to any third state, international organization, or private entity without the express authorization of the state to whom the resources belong; (3) states must not utilize any data obtained from remote sensing of another state's natural resources to the detriment of the latter state; (4) states are entitled to full and unrestricted access to all data obtained through remote sensing of their natural resources; and (5) all states have the right to participate fully in, and to have free access to, all information from remote sensing of natural resources outside of national jurisdiction (i.e., over oceans). This proposal also discusses non-interference with the exercise of a state's permanent sovereignty over it's natural resources.

The Soviet Union and France jointly have proposed a set of governing principles which would provide that (1) any remote sensing state must transmit to a sensed state, on mutually acceptable terms, information the former obtains regarding the natural resources of the latter; (2) no state which obtains, through remote sensing, information concerning the natural resources of another state shall make that information public without the prior consent of the latter state; and (3) remote sensing of Earth resources shall respect the principle of permanent sovereignty of states over their wealth and resources.

Two principal issues comprise the international aspects of remotely sensed data. The first is the question of whether any nation has the right to remotely sense the natural resources of any other nation. The second is how remotely sensed data should be disseminated and handled. In evaluating the first issue, the initial step taken by the Legal Subcommittee was to review the present status of international law regarding such matters. The United States maintains that there is no provision in international law restricting or inhibiting the remote sensing of the Earth from outer space. This contention is supported by the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, which states the "Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind . . ." It further states that "There shall be freedom of scientific investigation in outer space . . ." and

that "States shall facilitate and encourage international cooperation in such investigation." Additionally, in a review of the relevant records of the Legal Subcommittee, of the Outer Space Committee, and of the General Assembly, Stowe (1978) found that none of these bodies had intended to exclude activities such as remote sensing of the Earth from the broad endorsement of the freedom of exploration and use of outer space.

The second step taken by the Legal Subcommittee, regarding the right of a nation to conduct remote sensing activities, was to answer the question of whether recent technological advances in remote sensing were significant enough to consider them fundamentally different from the techniques in use when the 1967 Outer Space Treaty was negotiated. Further, if such fundamental differences were demonstrated, would they then be inconsistent with the Treaty's basic principles and, therefore, not covered by the Treaty? Through a series of recent discussions the subcommittee has not found that current remote sensing techniques are outside the scope of the Outer Space Treaty. It has also found no continuing support for the idea that such sensing can be undertaken only with the prior consent of the country being sensed (Stowe, 1978).

On the second issue, dissemination of remotely sensed data, the Legal Subcommittee has primarily concentrated on future operational remote sensing systems, since no restrictions exist on the current conduct of remote sensing. In an attempt to accommodate the desire of most states to encourage the development of remote sensing, while simultaneously protecting a state from the disadvantage of knowing less about its own resources than does some foreign entity, two proposals were submitted for Subcommittee consideration. In one, the Soviet Union suggested that data with a ground resolution higher than a specified number of metres should not be disseminated without first obtaining the permission of the imaged country, while there would be no restriction on lower resolution data. Stowe (1978) points out that the underlying theory in this suggestion is that higher resolution data could be used for natural resources exploitation, which perhaps unjustly asserts that such data threatens the sovereignty of a state over its natural resources.

Another proposal, forwarded by Canada, suggests the possibility of instituting certain constraints on the handling of processed data dealing with the resources of a sensed state, with the intention of respecting the confidentiality of such information to the extent necessary to avoid detrimental effects on the interests of the sensed state. Rather than endorsing a permission-to-disseminate scheme, this proposal suggests that before data could be sent to a foreign country it must first be sent to the sensed country. Stowe (1978) reports that the initial response to this suggestion seems to indicate that many delegations, which have previously favored data dissemination restrictions, may now be coming to the realization that the basic concern is not on open dissemination of the actual remotely sensed data, but rather on the dissemination of information which is based on analysis of the remotely sensed data.

Conclusions

From the perspective of a user, the most important conclusion to be drawn from this overview is that currently the legal acceptability of remotely sensed data is indefinite. In all likelihood, this condition will remain unchanged until more cases involving these data face appellate court review. Then legal precedents will be set, whether for or against, and remotely sensed data will have their own place in law. Their judicial review will no longer be predicated on the rules designed for other forms of evidentiary information, as they are now.

Furthermore, remote sensing practitioners should understand the legal uses and limitations of their technology. Although the increasing use of remote sensing may serve to strengthen their legal case, litigants must continually realize their vulnerability when using such data to analyze areas of high legal sensitivity. The most helpful contribution to the legal cause of remote sensing that can be made by scientists and technologists is to carefully conduct their remote sensing activities in a manner consistent with current judicial standards. Considering that the legal implications of remotely sensed data seem to be coming under increasing scrutiny, and may be changing almost as fast as the remote sensing field itself, remote sensing specialists should maintain an awareness of the dynamic conditions surrounding the legal aspects of their profession.

References

Chernoff, George, and Herschel Sarbin. 1971. *Photography and the law* (4th ed.): Philadelphia, Chilton Book Co., 158 p.

Felsher, Murray. 1972. Use of remote sensing in enforcement activities: present and future: *International Symposium on Remote Sensing of Environment*, 8th, Ann Arbor, 1972, Proceedings, pp. 153-156.

Jordan, Don. 1977. Surveillance, surveillance . . . all is surveillance: *Environment*, v. 19, no. 6, pp. 7-11.

Latham, R. P. 1970. Some preliminary thoughts on remote sensing and rights of privacy: *American Society of Photogrammetry Annual Meeting*, 36th, Washington, D.C., Proceedings, pp. 484-495.

Latin, H. A., G. W. Tannehill, and R. E. White. 1976. Remote sensing evidence and environmental law: *California Law Review*, v. 64, no. 6, pp. 1300-1446.

McCormick, C. T. 1972. *Law of evidence:* Hornbook series (2nd ed.): St. Paul, West Publishing Co., 938 p.

Parker, D. C., and M. F. Wolff. 1965. Remote sensing: *International Science and Technology*, v. 43, pp. 20-31.

Rango, Albert and Arthur Anderson. 1974. Flood hazard studies in the Mississippi River Basin using remote sensing: *Water Resources Bulletin*, v. 10, no. 5, pp. 1060-1081.

Redden, K. R., and S. A. Saltzburg. 1975. *Federal rules of evidence manual:* Charlottesville, The Michie Co., 439 p.

Rouse, John, Fabian Polcyn, Wesley James, and Roland Yunghans. 1972. Evaluation of remote sensing by environmental monitoring panel: *American Society of Photogrammetry Seminar on Operational Remote Sensing*, Houston, Proceedings, pp. 282-286.

Sive, David. 1970. Securing, examining, and cross-examining expert witnesses in environmental cases: *Michigan Law Review*, v. 68, no. 6, p. 1175-1198.

Stowe, R. F. 1976. Diplomatic and legal aspects of remote sensing: *Photogrammetric Engineering and Remote Sensing*, v. 42, no. 2, pp. 177-180.

_____. 1978. Legal implications of remote sensing: *Photogrammetric Engineering and Remote Sensing*, v. 44, no. 2, pp. 183-188.

Sullivan, J. L., and R. J. Roberts. 1975. Expert witness and environmental litigation: *Journal of the Air Pollution Control Association*, v. 25, no. 4, pp. 353-362.

(Received August 7, 1978; revised and accepted March 8, 1979)
