Ethics and Professionalism

Ethics in Photogrammetry and Remote Sensing: A Perspective from a Natural Resource Specialist

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INTRODUCTION

SO WHAT **ARE** ethics anyway? And what does something as abstract as ethics have to do with a precise science such as photogrammetry or remote sensing.

Ethics is something that touches every aspect of our lives, whether we are interacting with family or friends or are working as professionals. It's the science that deals with morality; of what is good and right. A guiding principle of ethics is to place one's self interests secondary to the interests of society at large (Singer, 1979). Ethics is a building block of our religious and legal institutions. Under the umbrella of ethics, appropriate rules of conduct for social interaction have been written and rewritten throughout human history. Volumes exist on ethics; written by some of the great philosophers, and religious and political leaders of modern history.

Despite the vast literary resource available on ethics, its concepts continue to elude and confuse us. There are those who argue that ethics is dead and no longer viable. Others insist that, without some code of behavior, we cease to exist as a civilized society. As science and technology have influenced humanity, some basic concepts of what is right and wrong have changed. Rules which were accepted by previous generations are no longer accepted.

Many of the social questions which we face today are ethical ones. We debate treatment of minorities, abortion, euthanasia, care for the elderly and poor, the death penalty, and animal rights. These questions have no easy answers, and decisions on how to address them have swung back and forth like a pendulum.

ETHICS AND NATURAL RESOURCES

The management of natural resources is another issue which is being debated on ethical grounds. We have begun to realize that natural resources are finite and that we are having a profound effect on this spaceship we call Earth.

We have become aware of the adverse side effects of agriculture and industry. Air and water pollution, acid rain, depletion of the ozone layer, and the likelihood of global climatic change are major environmental concerns. We have witnessed a decline of European forests due to a complex of causes still not fully understood. We read about tropical deforestation. We watch as portions of southeast Alaska's pristine coastline are blanketed with oil from a catastrophic spill, killing thousands of fish, birds, and sea otters.

In the Pacific Northwest, there is a debate about whether or not the remaining old growth forests, once thought to be stagnant and unproductive, should be set aside as reserves to ensure the future of wildlife species such as the northern spotted owl. And what price should the social and economic infrastructure of a region that is heavily dependent on the forest products industry pay to maintain these reserves for future generations of wildlife and people?

A guiding principle of public lands resource management has been to provide for society at large rather than to respond to a few special interest groups. Gifford Pinchot's concept of "The greatest good for the greatest number in the long run" provided the early direction for the USDA Forest Service to manage the Nation's National forests (Pinchot, 1947). The Agency's current vision statement, "Caring for the Land and Serving People," also reflects this philosophy.

As increasing populations demand a better quality of life, greater demands are being made on our resources. Often these demands are in conflict; timber vs. recreation vs. wildlife vs. wilderness. Consequently, resource managers, especially those in the public sector, have had to address some difficult questions. Do we continue to harvest timber at present levels to provide for the economic stability of local communities? Or, do we make conscious decisions today to provide for the other organisms with which we share this planet and for future generations of people?

Today's resource managers must address issues which are more complex than they have ever been. They must consider the consequences of alternative management scenarios on the vegetation, wildlife and fisheries, water, soil, air, and cultural resources of an area before they can arrive at a sound land management decision. To do this, they must effectively integrate large volumes of scientific data with perceptions of diverse and sometimes hostile publics.

ETHICS, PHOTOGRAMMETRY, AND REMOTE SENSING

The technologies of photogrammetry, remote sensing, and related disciplines offer opportunities to provide a significant part of the scientific data required to support decisions affecting the future of our natural resources. Computers and geographic information systems can reduce these data into analytical products and maps which are readily understood by professionals as well as the lay public.

How does ethics apply to the technical photogrammetrist or remote sensing specialist who is responsible for providing information to support resource management decisions? Undoubtedly, it applies in many ways. Two which immediately come to my mind, reflecting my own experiences, are

- The use of remote sensing technology to make sound, unbiased assessments to support resource planning and decision making.
- The manner in which new technologies or new approaches are evaluated for operational use.

APPLYING THE TECHNOLOGY

The methods associated with acquisition, analysis, and display of photogrammetric or remote sensing data are varied, complex, and highly specialized. The line manager with a working

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knowledge or interest in photogrammetry, analysis of digital data, or data base management is the exception rather than the rule. Managers may not have any idea of how a riparian zone, an old growth forest, or insect outbreak may appear on a color-IR aerial photo or satellite image, or if these things can even be resolved. This expertise falls in the realm of the photo interpreter, image analyzer, or data manager who must develop a level of trust with line managers. That level of trust is maintained through consistent delivery of reliable information.

Technical specialists exercise professional expertise in the selection of appropriate tools, sampling methods, and procedures for analysis and presentation of data. They must be aware not only of the strengths of alternative methods but also of their limitations. If, for example, a map of vegetation communities is required, what level of detail can be reliably obtained from satellite data and what must be obtained from aerial photos or ground surveys? Don't try to create a detailed vegetation map solely from satellite data if it will not meet the information requirements or accuracy standards. Overextending the capabilities of a technology will only serve to discredit it when it is discovered that the end product does not represent the conditions on the ground.

There are few technical specialists who don't have some opinions about a resource question they are investigating. Consequently, there exists the temptation to color the results of an evaluation with personal bias. Remaining objective and keeping an open mind often requires great discipline and is essential if the integrity of an evaluation is to be maintained.

I have a deep personal and professional interest in the impacts of air pollution on our forest ecosystems and how remote sensing technology can help to assess these impacts. On numerous occasions, I have been disturbed by "scientific" papers alleging that an area of forest damage is the result of acid rain or discharge of industrial wastes when in fact there is little or no evidence presented to support this conclusion. There have even been instances of where I had personal knowledge that the REAL cause of the damage was insects, high winds, or inundation.

Whenever I am exposed to this kind of reporting, I am reminded of the fable about the boy who cried wolf. Biased conclusions are soon discredited. But what happens when a real case of acid rain damage or worse is discovered? Who will believe it then? Future generations could pay a great price for conclusions clouded by the personal biases of the technical specialist.

Assessing New Technology

The requirement to design a rigid test of the capabilities of a new sensor technology has an ethical as well as a scientific side. Anyone who has looked at a new sensor product for the first time has undoubtedly experienced the "gee whiz" syndrome; that euphoric feeling that there's no end to the possibilities of this technology. I experienced it over 25 years ago when I viewed the very first color-IR photos I had acquired of bark beetle damage in the South. It happened to me again when I reeled out the first role of panoramic U-2 photos taken over areas damaged by gypsy moth in Pennsylvania, and again, when I saw the first SPOT scenes. And, hopefully, I will experience that feeling again during my remaining years as a professional with a deep interest in remote sensing.

But there is a danger associated with that feeling of euphoria; the temptation to oversell a new technology or product before it has been thoroughly evaluated. Add to this the potential of a quick profit or a chance to earn a reputation amongst one's peers, and the temptation to oversell could become overwhelming.

No matter how intense that euphoria may be, as ethical professionals, we cannot afford to lose sight of the fact that the effectiveness of new technology lies in its ability to produce hard, reliable data within a specified time frame. And that ability must be repeatable.

Test designs must determine how the results of a new approach or technology compare with those of established methods. Under what range of conditions is the new method effective? What are its limits of accuracy? What levels of omission or commission error can be expected?

Acquisition of sufficient ground or other reference data is often a costly, logistically difficult aspect of the evaluation of a new technology. Consequently, it is often tempting to shortcut this aspect of an evaluation. Without good reference data, it is impossible to reach sound conclusions.

Reporting Results

There is an ethical responsibility associated with reporting the results of investigations. The old adage, "garbage in, garbage out," applies to data acquired through remote sensing just as it does to data acquired by any other means. Today, with the availability of geographic information systems capable of producing attractive, multicolored maps, even "garbage" can be packaged to appear to be an accurate, reliable product. This can lead resource managers to believe that they are making an informed decision when in fact they may not be.

Resource managers may not necessarily be up to date on the workings of state-of-the-art remote sensing technology, but they realize that, like anything else, it has its limitations. They are inherently suspicious of "black box" approaches to data analysis and must suffer the consequences of an irate public or board of directors if a bad decision is made based on faulty data. Failure to acquire or present data on the accuracy of an analysis can ultimately result in the loss of credibility of the technology. The technical remote sensing specialist has a professional and ethical responsibility to present both the strengths and weaknesses of completed work.

THE LAND ETHIC AND "GROUND TRUTH"

The 1990s promises to be a decade dedicated to the environment. We hear more and more about the need for a land ethic. This notion was verbalized in 1949 by Aldo Leopold in his classic book, *A Sand County Alamanc*. According to Leopold, a land ethic reflects the existence of an ecological conscience and, in turn, a conviction of individual responsibility for the health of the land (Leopold, 1949). Recently, a call for a statement committing to a land ethic was suggested for inclusion in the code of ethics of the Society of American Foresters (Coufal, 1988). Recent interest by the forestry profession in biological diversity, forest health, long term productivity, and a concept referred to as "New Perspectives in Forestry" reflects a renewed commitment by the forestry profession to a land ethic.

Those of us working in photogrammetry and remote sensing once referred to the ground data acquisition phase of our work as "ground truth." We have since learned, however, that their is no more absolute truth to ground data than there is to data acquired from serial platforms. Consequently, the term has fallen from favor. However, I still like it. It has a much deeper meaning to me. I regard "ground truth" as a periodic reassessment of our values. It is an assessment of how each of us as resource professionals—foresters, geologists, photogrammetrists, biologists, or whatever we happen to be—influence the way the societies of spaceship Earth manage and protect the resources on which we depend for the common good of our present and future generations.

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