

E STATE RESOURCE MANAGEMENT & ROLE OF REMOTE SENSING

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From the Brown Administration viewpoint, we are indeed facing the reality of limits. There is the subject of carrying capacity. We have always responded to issues involving the reality of supply and demand on resources. We constantly face a demand for more water. More water for Southern California for what becomes non-existing sources in the North. That leads to a lot of problems. Without question, I would agree with Theodore Roosevelt. He suggested that we know we will face an ironless age, but we can not afford to live in a woodless one. So as a major theme for my agency, I have argued that we need to upgrade the productivity of the state's natural systems. One of the realities for me, as a Resource Manager, and anyone else in this position, is making decisions without an adequate data base. It is decision making in the dark. Those are serious decisions and affect the quality of not only individual lives but whole sectors of society. Being a budget manager, an executioner as it were, you are getting some news this morning. Having to sleep with those kinds of decisions and conditions constantly goes with the reality of the job these days. Not the least dilemma of not having adequate information is constant controversy. Being a regulator of oil and gas, forestry, fisheries, geology plus general environmental quality and development means that you have to stand up and take a lot of heat, and be able to respond with the best information you can come up with. My frustration is that I rarely have adequate information. My task assignment each day is to feel those issues where no one else wants to make a decision, or no policy base exists for it. I find it to be a very exciting position and one worthy of a one time stint at public service. But I am certain that the future can be managed better, and that remote sensing people can provide important information and thus enhance the quality of both of our fields and the quality of our future.

Remote sensing has given us a breakthrough in the information we have, and in being able to produce that detailed information visually. Until recently, I have been very skeptical about the real value of satellite technology for making down-to-earth decisions that confront resource managers today. Two experiences in particular have recently reduced my skepticism and are the reasons I have accepted this invitation today. I would not have done so six months ago.

One resulted from a recent visit to Kenya where I visited the United Nations on a program. While there, I had a chance to see a remarkable program resulting from satellite imagery which concerns mapping soil types and conditions in North Africa. The type of capabilities that I

wish we had in California. The other experience that reduced my doubt has been in seeing some of the positive results from satellite imagery programs conducted by other departments and agencies. I tend to be a very practical person and must consider the pressures that government people work under today. It is only when I see practical results that I can defend in the public arena for budgets and that I can honestly become enthusiastic about a project. So here I am. I even had a wonderful discussion with a colleague who is on the governor's cabinet and a strong proponent of NASA and its satellite programs. I told him that I have had a transition.

While satellites are new, remote sensing is not. Geologists, foresters, soils scientists, wildlife biologists, and other specialists have relied for years on aerial photography for primary data. In addition to detailed information that can be obtained quickly and inexpensively by photointerpretation. The broad overview presented by such photos allows a graph of resource relationships which is difficult or impossible to get on the ground level. Satellite imagery expands that overview and further increases our conceptual grasp.

Looking to the future, as I feel we must, I believe California needs to upgrade the productivity of its natural systems. As a result, I have put together a 20 year plan for the State of California's resources. It includes a major section entitled data base. One of the themes argues that we must take income from non-renewable sources that will only be with us once - for instance, one time oil revenues - and invest part of that income into upgrading these programs, which includes data base.

I entitled the program "Investing for Prosperity" because by investing in resources today, we can assure both a continued economic strength and a satisfactory quality of life for all our citizens and tax payers. It is having interesting success. It was launched after Proposition 13 was passed. In fact, I believe until Prop 13 and a tax rebellion occurred, it would not have been listened to. Until society had to slow down and start making some judgements and selecting priorities, we could not have been heard nor would our argument have made sense, but we have done very well.

We passed five bills after that proposition. This legislation includes funding that allowed us to create a new forest improvement program for the state. We discovered that with 17 million acres of the best timberland in the world, five million had never been replanted after being cut. Many of the potentially productive streams had been blocked for a hundred years. We unplugged 100 miles this year, and we will double that next

year. Interesting uses of technology have been planned. A pilot desalter project was put together to desalt agri waste water this year. We started distribution of water conservation devices to every household in the state. Not only does it save fuel because the water people do not use remains unheated, but more importantly, it involves the public and increases their understanding for the importance of supporting programs such as this one.

Here is a brief overview on portions of the program which seem likely candidates for use on remote sensing techniques.

We have carried out some of the activities for quite some time, obtaining needed data by traditional means of aerial photography, as well as more sophisticated techniques, which can help us make more accurate decisions and design the best programs to implement these decisions. Our forestry and wildlife program will seek to reverse the serious decline in productivity of California's forests by reforesting 1.1 million acres and by salvaging 11 billion board feet of timber killed by insects and disease. In addition, through an aggressive vegetation program, we hope to increase forest production, wildlife habitat and to improve survival of seedlings along with the growth rate of young timber.

An important part of vegetation management is chaparral management. One of the most effective visuals I have ever seen is a statewide mosaic of Landsat imagery which shows in a striking manner, extent and location of the chaparral areas of California. The picture has been an effective aid in demonstrating the need for a new approach to fire control through vegetation management, as well as possible energy uses from chaparral and other factors.

To describe, verbally, chaparral problems to a busy legislative committee, or a busy group of reporters is time consuming and often a hopeless task. To be able to show them that photograph and allows everyone instantly to know what the potential was. In fact, we have 100 million acres of Chaparral in California. Between 10 and 20 million acres of that is choked with brush, making it relatively unusable. The Landsat derived photos gives me a position to present my case.

Breaking the fire and flood cycle is an important factor in a mediterranean climate like California. We designed a program using helicopters and new techniques for controlling and burning of dense, chaparral areas which present fire hazards. This program will need extensive and detailed surveys of vegetation type, age and density, as well as information on soils, sludge and geology. I foresee a positive role for Landsat technology in providing this information in a timely and economic manner.

Our Fish & Game program will increase wetlands and other important habitat of fish and wildlife. It will also improve our ability to protect habitat in part by making available better data on fish and wildlife itself. There are many areas that need research, such as measuring ocean biomass which constitutes a very critical issue, although virtually no information is at hand. This is an important factor if we are going to manage the productivity of our globe as we must, in my opinion, to maintain the quality of our lives.

The data we need can be partly acquired through remote sensing, including vegetation, age and density, and human activities on lands that constitute important habitat. You will note that this dovetails neatly with the needs of the forestry program. Similar overlaps will be seen in many of our programs as they develop. This cross functional use in information is important because it will help reduce costs. Even more importantly, will help us break past traditions of single research decision-making and provide a sound basis for integrated management wildlife resources.

Our water related programs are intended to help eliminate or reduce ground water overdrought. Presently, much of the West is committing suicide, plain and simple. Palm Springs, a lovely vacation community in California, has 50 golf courses and, as a result, the water table is dropping six to eight feet a year. In the Rocky Mountain area, water is being used faster than it is being replaced. The San Joaquin Valley, one of the richest agricultural areas in the world and very important in feeding the population of the United States, is also in difficulty because of overdrought of underground water.

Other problems in these soils include salt buildup and a lack of drainage. Increased urban and agricultural water use pressures plus other factors, require that we implement far better water quality programs, including soil erosion and other data management techniques. Remote sensing can help identify the location, amount and type of crops being irrigated in overdrought areas, the extent of soils poorly drained and affected by salt. Crop information to help us plan and carry out water conservation programs, and periodic assessment of soil erosion in related land use that affect the quality of such areas as the Lake Tahoe Basin.

One of our most serious areas of neglect in this state, in fact in this nation, is soils. Civilizations live and die historically by how they treat their soils. We have tended to ignore ours. A statewide soil program calls for incentives to maintain and restore soil productivity on private forest, agricultural and wildlands. Data will be collected

to monitor areas where erosion is increasing and production declining due to inadequate management. This data will also be used to expand soil vegetation mapping, identify variable erosion hazards, and enumerate periodically, the location and extent of land uses affecting corrosion and productivity.

Another factor concerns protecting coastal resources. The coastal resources program will provide a thousand more access sites along the coast to protect wetlands and natural coastal areas. Remote sensing will provide basic information to monitor land use changes that threaten these resources.

The Parks & Recreation Program involves acquiring and developing lands for park facilities. We need to measure change in our landscape designated for recreational purposes. For more efficiency in gathering data, all these programs will help meet the needs of general resource management and improve the exchange of data among all levels of government.

As you may know, a number of major satellite link programs are already in progress within the resources agency. The Department of Water Resources is using satellite imagery to inventory irrigated lands. Research is continuing in crop identification, which will help greatly in several water management programs.

Irrigated land use and crop data will allow DWR to basically determine how much water is used, estimate future water use, identify potential water shortages and implement improvements in reservoir operations.

The Department of Forestry has been using Landsat data for three years. A general cover classification was created in 1978 and 1979. Cover types were tabulated by acreage and county. Currently, Forestry and NASA are working on a second phase to classify data at the species level in five test counties - Santa Cruz, Humboldt, Nevada, Placer, Eldorado. Forestry is installing a computer program which will give it and other users the ability to process Landsat data.

The Department of Conservation is funding an important prime land map series. They are also developing a statewide computerized farmlands data base. Both will be updated regularly to provide information on prime land conversion as requested by the Governor, the state legislature and other key decision-makers. A proposal has been submitted to NASA Ames Research Center to explore the possibility of using Landsat data to update the map series and the data base.

Researchers at the University of California - Santa Barbara, have achieved promising results using Landsat and high altitude imagery to monitor the conversion of farmlands. We hope such techniques will mean significant dollar savings in these programs. With NASA's help, the state's electronic data processing system is now being inventoried to identify what additional equipment and programs are needed to process satellite data most efficiently.

What I have given you today is an admittedly incomplete review of the resource management needs of California which might be satisfied by remote sensing. We have many other activities that require research data and a large number of programs for which to collect such information. Many of these programs might benefit from improved techniques using Landsat data. Last week, we infact, requested and received a summary of all potential types of data and research of the various departments that I am responsible for.

In the future, we want to find out where satellite imagery can be used to improve our resource programs and then plug it in. It promises to be an exciting program, one with fruits we have not yet imagined.

Finally, we appreciate a letter received from NASA asking us to serve as a Coordinator of the California Integrated Remote Sensing System. Since we do have departments already utilizing it, we happily will accept that opportunity and believe we will increase the use of programs that you people are responsible for, and look forward to cooperating with you. The era of single purpose decision-making or single agency dominance of the budget process is behind us. Success will come in the future for all of us, as it has with resource agencies in the past two years, by linking together programs that are relative to each, focusing on applied process, and enhancing the quality of the state and the nation through that effort.